MICROWAVE SYSTEM PREPARATION GUIDE FOR FEDERAL COMMUNICATIONS COMMISSION AND FEDERAL AVIATION ADMINISTRATION REQUIREMENTS

CONTENTS

1. GENERAL

1.1 This Section tells how to obtain and fill out FAA and FCC forms when a telephone company plans to construct a microwave radio system. Since completion of these forms requires technical information, certain applicable microwave route design considerations are included in this Section.

2. TECHNICAL INFORMATION REQUIRED BY THE FCC AND THE FAA

2.1 An applicant who proposes to construct a microwave radio system must first obtain Federal Communications Commission (FCC) construction permits. Forms must be prepared and submitted to the FCC for each site. The materials and information needed to prepare the application are: (1) FCC and Federal Aviation Administration (FAA) forms, (2) certain parts of the FCC Rules and Regulations, (3) topographic maps, and (4) certain microwave route engineering information which will be described in paragraphs 3 through 5 of this Section.

2.11 The FCC Rules and Regulations which are applicable to common carrier microwave users are contained in Volumes I, II and VII. These volumes may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402. A one-year subscription is $8 (total price for three volumes).

2.12 Section 21.29 in Part 21, Volume VII of the Rules and Regulations lists FCC forms which are applicable to common carriers. FCC forms may be obtained by placing a telephone call request to the nearest FCC field office or by written request to the FCC offices at 1919 M Street,

N.W., Washington, D.C. 20554. Common carrier field offices are located in St. Louis and New York City. The locations of the FCC engineering field offices are contained in Section 0.121 of Part 0 in Volume I. Each application must be accompanied by an appropriate filing fee as specified in Subpart G of Part 1 in Volume I of the rules.

2.13 Part 17 of Volume I of the FCC Rules and Regulations contains information to be used to determine whether the proposed tower location needs to be reviewed by the FAA. FAA forms may be obtained by telephone call or written request to the nearest FAA regional or area office. All FAA regional and area offices are shown on the back of FCC Form 714.

2.14 The FAA publishes an "Obstruction Marking and Lighting Advisory Circular 70/7460-1" which illustrates marking and lighting. It may be purchased for 60 cents from the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402. REA Bulletin 340-6, "Structures That May Affect the Use of Navigable Airspace," also discusses FAA regulations and requirements.

2.15 Indexes of topographic maps for plotting station locations may be obtained free of charge by writing to the U.S. Geological Survey Map Offices at 1200 Eads Street, Arlington, Virginia 22202 or the Federal Center at Denver, Colorado 80225. The index may be used to locate applicable maps covering the area in which the sites will be located. The maps may then be purchased from the nearest map office. The U.S. Geological Survey also maintains sales counters in many large cities. The U.S. Forest Service and the U.S. Army Corps of Engineers are other sources of maps.

2.2 FCC Form 401 is the basic form which the applicant will use to apply for a new or modified common carrier radio station construction permit (example attached). Several pages of instructions are attached to each Form 401. Particular attention should be given to the accuracy and completeness of information entered on the form.

2.201 Site coordinates to be shown on the form may be determined by a survey or they may be taken from topographic maps. Figure 1 illustrates a method of obtaining latitude and longitude from a map. An engineer's scale may be used for this work. The scale and map should be chosen to permit reading the location to the nearest second. Make certain that the geographical coordinates shown in the application agree with the site plotted on the map which is to be submitted with the application.

2.202 Transmitter frequencies entered on the form should be selected only after considering equipment design limitations and RF interference possibilities. These considerations are discussed in

paragraphs 3 and 4 of this section. When frequency diversity operation is intended, an exhibit must be submitted per Section 21.100 (a) of the FCC Rules and Regulations.

2.203 The maximum modulating frequency to be shown on the form is the highest multiplex channel carrier frequency or any other highest baseband frequency such as a continuity pilot. (The FCC is considering a proposal to eliminate the requirement to show the pilot frequency when it is the highest frequency.) The value assigned to the maximum modulating frequency is important because the FCC will use it to determine the necessary bandwidth of the radio channel. This information may be obtained from the radio equipment manufacturer. The necessary bandwidth shall not be greater than the FCC type accepted emission designator for the microwave transmitter which is to be used in the system.

2.204 The transmitter characteristics, including the type accepted emission designator, may be obtained from the transmitter equipment manufacturer or from the "FCC Radio Equipment List - Equipment Acceptable for Licensing." This publication may be examined at any FCC field office or purchased from the Cooper-Trent Company, 1130 19th Street, N.W., Washington, D.C. 20036. The cost is approximately $25. The manufacturer and transmitter type number must be known before its characteristics can be located in the above mentioned document.

2.205 Each applicant for a construction permit must answer questions on FCC Form 401 which are intended to show how transmitter operation will be protected and monitored. Where a station is unattended, the applicant usually provides an alarm system arranged to transmit alarms to an alarm center. The preferred location for an alarm center is one which has 24-hour per day maintenance coverage. Basic alarms should include transmitter failure, tower light failure and opened door. (Additional alarms are desirable.)

2.206 Antenna characteristics must comply with Section 21.108 of the Rules and Regulations. The FCC has on file the radiation patterns of most commercially available antennas. If the applicant proposes to use an uncommon antenna, a polar diagram of its radiation pattern must be submitted with the application. Otherwise, this portion of FCC Form 401 may be completed by stating "On file with FCC." Some manufacturers use an isotropic source as the gain reference point for their antennas. It should be noted that FCC Form 401 uses a halfwave dipole as its reference.

2.207 A vertical profile sketch of the transmitting antenna structure must be prepared and submitted with the application. Section 21.15 (g) and instructions in FCC Form 401 should be followed closely when preparing this sketch because it is needed not only to determine height of the antenna(s) and/or reflector(s) mounted thereon but the hazard the structure may present to flights from nearby airports and

air traffic patterns. It is always advantageous to an applicant to make a special effort to determine whether there are any nearby structures which could tend to shield the proposed structure with respect to its hazard to aircraft. This may eliminate a need to light the proposed structure. It might also reduce the possibility of an unfavorable FAA decision based on air hazard considerations.

2.208 Topographic maps submitted with the application must not be cut in any way which would remove the positive border identifications of latitude and longitude. The sites should be marked with a fine line cross to prevent obliterating map information in the vicinity of the site. A circle may be drawn around the cross to permit easy location of the sites when examining the map. Site coordinates and site name may be typed on a piece of gummed paper and placed on the map near the site.

2.209 Since periodic measurement of transmitter frequency is an FCC requirement, the applicant must show how he will meet this obligation. The accuracy of the measuring instrument must, of course, be better than the allowable frequency tolerance of transmitters as required in Section 21.101 of the FCC Rules and Regulations. Instead of purchasing test equipment, an applicant may elect to have this work done by entering into a contract agreement with a service agency.

2.210 Section 21.706 (a) and (b) of the Rules and Regulations and Item 52 of the FCC Form 401 require a showing as to how construction of the proposed microwave system would serve the public interest. Sections (c) and (d) of the same rule concerns a requirement for a coordination calculation to be attached to Form 401 when an applicant proposes to construct a site within coordinating distance of a satellite system earth station. A sample calculation is attached to this Section (see Figure 2). Paragraph 5 of this Section discusses that subject.

2.211 Section 1.70 of the FCC Rules and Regulations describes a requirement for a statement to be submitted with the application when the proposed site is located on U.S. Forest Service property or Bureau of Land Management property.

2.212 Legal and other data required to be submitted with FCC Form 401 may be extracted from the common carrier reports and filings prepared by the telephone company as required by Subpart E of Part 1 in Volume I of the FCC Rules and Regulations.

2.213 An applicant should read Section 21.15 to determine that the contents of the form are in agreement with that section of the FCC Rules and Regulations. Each exhibit should be labeled as "Exhibit 1, 2, etc."

2.214 FCC Form 401 must be signed by the person responsible for preparing the engineering information entered on the form and its

associated exhibits. The form must also be signed by the applicant or a person who represents the applicant. Instructions attached to FCC Form 401 describe who may sign it and what their qualifications must be.

2.3 FCC Form 714 is a supplement to the application for a new or modified radio station authorization (see attached example). It serves to notify the FCC that an applicant either has or has not submitted his proposed antenna structure information to the FAA depending upon whether or not it exceeds the FAA criteria for hazards to aircraft. It is an uncomplicated one-page form with the locations of all FAA area offices, regional offices and a map printed on the back of it. The map, which has regional and area boundaries, may be used to identify which office will be responsible for processing an application in the geographic area of a proposed antenna structure.

2.4 An application for a radio station license or modification must be submitted on FCC Form 403 (see attached example). This form is to be submitted prior to expiration of the construction permit and only after the station has been constructed in strict accordance with the terms of the construction permit. Some of the information required for this form may be taken from the construction permit. Much of FCC Form 403 deals with the possibility that some of the information submitted on FCC Form 401 may have changed significantly during the station construction time interval.

2.5 Section 21.29 of the FCC Rules and Regulations describes other FCC forms which are applicable to specific situations. An example of these is the form used by a licensee to renew a station license.

2.6 FAA Form 117 has been replaced by FAA Form 7460-1. Parts 17 and 21 of the FCC Rules and Regulations include instructions for determining whether the applicant's tower height will need to be reviewed by the Federal Aviation Administration. If the applicant determines a review will be necessary, he must complete FCC Form 714 and FAA Form 7460-1. The FCC will review the information in FCC Form 714 and may direct the applicant to file an FAA Form 7460-1 before they will take any further action on an application for an FCC construction permit. FAA Form 7460-1 may be obtained at any of the FAA regional or area offices listed on the back of FCC Form 714. When an applicant has determined that a prospective location will require FAA clearance, he should submit FAA Form 7460-1 as soon as possible. In some cases, the FAA area office Air Traffic Division personnel may be contacted by telephone to give an informal opinion about the possibility of an air traffic conflict. FAA clearance can save considerable work and time if it is done before the FCC applications are completed.

2.61 Answers to questions in FAA Form 7460-1 should be taken from information which will be used on FCC Form 401. Where there

is doubt about the necessity of marking and lighting a proposed structure, this too may be discussed with persons in the nearest FAA regional or area office. A list of these offices with addresses and phone numbers is on the cover sheet attached to FAA Form 7460-1. In some situations the FAA regional or area office will request that they be advised of the progress of construction. In all cases where tower lighting is required, the U.S. Coast and Geodetic Survey must be notified as described in Section 17.57 of the FCC Rules and Regulations.

3. FREQUENCY SELECTION

3.1 Because frequency planning requires current data relating to electrical characteristics of equipment and requires knowledge of currently available radio channels, it is necessary for suppliers, consultants and coordinating groups to work closely so that efficient use of the available frequency spectrum may be made.

3.2 The common carrier frequencies available to microwave users are listed in Section 21 of the Federal Communications Commission's Rules and Regulations. There are common carrier frequencies listed in the 2, 4, 6, 11, 13, 17, 19, 30 and 39 GHz bands. In the lower frequency bands manufacturers and the FCC have established mutually acceptable channelizing plans but such plans are not shown in the FCC Rules and Regulations. Current manufacturer plans for the 2, 4, 6 and 11 GHz bands are included here as Figures 3, 4, 5 and 6. The International Radio Consultative Committee (C.C.I.R.) recommends international frequency plans in its Volume IV, Part 1, Section F, "Radio Relay Systems," publication.

3.3 Frequency or channel selection is limited by equipment design. This means the transmitter, the receiver, the duplexing/diplexing units and the antenna design performance can only be achieved if their operating limits are recognized when assigning frequencies. Beginning with the antenna, an examination of radiation patterns for various antennas shows that values of 30 to 80 dB of directivity can be obtained depending on antenna design. If an antenna at a repeater point radiates a signal behind it which is only 35 dB below the signal level radiated by the other antenna on the same tower, it is quite likely that each adjacent receiving station will receive two signals separated in level by 35 dB. If both transmitters radiate the same frequency at a repeater, the wanted to unwanted signal ratio will be 35 dB at the adjacent receiving points. This is an unacceptable ratio (discussed in paragraph 4). If the same repeater station were equipped with antennas providing 55 dB or more of discrimination, the signal to noise design objective could be met. Antennas providing this amount of discrimination are heavier and consequently require more substantial antenna supporting structures. An alternate method of preventing intrasystem interference is to select a frequency plan which offsets the transmit frequencies at each repeater. An offset of several megacycles will utilize the discrimination design (susceptibility, selectivity) of the receiver. This can be illustrated by reviewing Figure 7. An interfering frequency 10 megahertz away from

the wanted frequency will be attenuated approximately 30 dB in this particular receiver. If the interfering frequency is 140 MHz above the wanted frequency, the local oscillator can produce an unwanted 70 MHz interfering frequency. The receiver discrimination plus the antenna front to back discrimination can provide an acceptable signal to noise ratio in a system having two or more microwave paths.

3.4 At each location the transmitter and receiver coupling loss provided by the duplexer/diplexer assembly must be reviewed in terms of transmitter-receiver frequency separation. Usually the same receiver interference pattern used for the previous discussion may be examined to determine the effect of transmitter power at "X" frequency exposed to its mated receiver at "Y" frequency. As an example, Figure 7 shows an interfering signal of +30 dBm (transmitter output power) would have to be tuned to a frequency at least 75 megahertz away from the desired receiver frequency. This curve is formed by plotting a series of points which indicate the frequency and power of an unwanted signal which causes the baseband noise at the receiver output to rise by a measurable amount (usually less than 1 dB). Equipment whose performance is illustrated by Figure 7 must be operated with a frequency plan that has a minimum of 75 MHz transmitter-receiver frequency separation.

3.5 At this point it should be appreciated that while each frequency band may contain many channels, only certain selected channels can be used successfully in a new system. At route junctions frequency selection becomes more difficult because consideration must be given to the effect of added frequencies in the interference evaluation.

4. RADIO FREQUENCY INTERFERENCE CONSIDERATIONS

4.1 Although each common carrier station must remain free from harmful interference, microwave frequencies assigned to common carrier users are not used exclusively by a single licensee. If two licensees select the same frequency and happen to have a line of sight path between their sites, a possibility of RF interference exists. When a map study of desired locations for microwave sites results in a line of sight path from a transmitting antenna to a receiving antenna several stations away from it in the same system, there is a possibility of RF interference. Therefore, one of the major objectives of microwave route design is to select locations and frequencies which: (1) will not introduce objectionable RF interference into an authorized or proposed system, (2) will not receive objectionable RF interference from an authorized or proposed system, and (3) will not introduce objectionable RF interference between stations within its own system. Since microwave energy is highly directive, narrow beam antennas, terrain obstructions, careful selection of frequencies and polarization of the antenna may be employed to reduce interference to acceptable levels.

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4.2 A route design objective of "wanted" to "unwanted" RF signal ratio may lie in a range between 45 and 96 dB. The particular design value is determined by relating it to the voice channel signal to noise objective. In a system, voice channel noise is contributed by several sources including RF interference. If a value of RF interference noise assigned to a single hop is made less than the noise contributed by the receiver front end, fading will cause the receiver noise to rise in proportion to the fade and "mask" the interference signal. Calculations may be performed to relate voice channel noise to interference noise. Factors such as the receiver noise figure, receiver selectivity, I.F. bandwidth and channel density are included in such calculations. A practical approximation of 60 dB may be used as a realistic value for less than 600 channels on systems of one to four hops. This is a good intersystem and intrasystem objective. Values as high as 96 dB may apply in the special situation where an unmodulated signal radiates into a receiver at a frequency which differs from the wanted carrier frequency by an amount equal to the highest baseband frequency of the wanted carrier. This would appear to be a highly unlikely situation. Therefore, a practical value of 60 dB signal to interference ratio should provide negligible system performance degradation due to interference.

4.3 Assuming an objective of 60 dB wanted to unwanted signal ratio is chosen, a tentative route design should be examined for "overreach" interference between stations within the route. To do this, a specific frequency plan must be assumed. Since most plans reuse frequencies at every third station, the transmit antenna bearing at station 1 should be compared to the receive station bearing at station 4 (see Figure 8). The angle formed by the wanted and unwanted path bearings may be compared to an antenna directivity chart to determine antenna discrimination at each end of the unwanted path (see Figure 9). Antenna size, antenna type and the frequency to be used will determine the number of decibels of discrimination which an antenna can introduce. Since the wanted and unwanted signals travel different path lengths in the example of Figure 8, attenuation of the unwanted signal is greater than the wanted signal at station 4. This represents a favorable factor and a dB value can be assigned by comparing the voltage ratio in terms of path mileage as follows:

$$dB = 20 \log \frac{D_1}{D_2}$$

D_1 = distance from station 1 to station 4

D_2 = distance from station 3 to station 4

If the antenna gain at station 1 is smaller than the antenna gain at station 3, an additional number of decibels of discrimination can be taken (reverse situation will be an unfavorable factor). The dB value of this factor is the difference in gain between antennas at stations 1 and 3. Most antenna manufacturers have directivity patterns which

illustrate the discrimination to a signal which is polarized 90° from the feed assembly polarization of the antenna being tested (see Figure 11). As an example, an antenna whose feed assembly is horizontally polarized can provide 20 dB or more of discrimination to a vertically polarized signal arriving on the same bearing as the wanted signal. If the cross polarized signals arrive at separate bearing angles, less polarization discrimination is realized. A value of 6 dB is used for interference evaluation since arrival polarization of the unwanted signal is not known precisely. When all transmitters on the same route have approximately the same power output, no factor for wanted and unwanted transmitter power difference should be considered. An example of a typical signal to interference calculation is shown in Figure 10.

4.4 All of the factors discussed to this point may not yield the 60 dB objective at every microwave receiver. Those paths not meeting the objective should be examined further for possible substantial earth blocking. Figure 12 illustrates heights of obstructions at various distances along a path which should provide 10 dB of attenuation. If earth blocking does not resolve an overreach problem, a nonstandard frequency plan may be used as a last resort to obtain isolation. It should be noted, however, that indiscriminate use of frequencies is not acceptable to other users and the FCC.

4.5 Figure 13 illustrates a possible interference situation in which station 1 of an existing system can introduce unacceptable interference into station 6 of a proposed system. In order to properly evaluate this potential interference, the stations of the existing system must be plotted on the same map as the proposed route. Aeronautical charts are sufficiently accurate to provide a good base for this work. After the critical distances and angles are diagrammed, the following information must be obtained:

(1) Existing or authorized system frequency plan
(2) Existing system antenna sizes and types
(3) Existing system transmitter power
(4) Existing system receiver susceptance to interference curve

When this has been accurately plotted on the chart, a systematic search of existing sites should be completed to determine probable interference situations. Where observation indicates a careful evaluation is needed, the method used in paragraphs 4.3 and 4.4 may be used. This method should also be used to evaluate the effect of a proposed station on existing stations. For example, in Figure 13 station 6 could interfere with station 1. Every existing microwave system within 125 miles of a proposed radio site should be considered to determine the amount of interference which could occur if a radio station were constructed on the proposed site. FCC field offices have a record of all existing

licensed radio stations. Their record may be inspected by a prospective licensee to determine the location of existing stations operating in the frequency band of interest. Copies of any page in the record may be purchased for approximately 15 cents per copy from the Cooper-Trent Company. Alternatively, the complete record (Volumes I and II) may be purchased for approximately $175. When the methods of providing discrimination fail to yield an acceptable value, selection of a new location for one or more of the proposed stations will be necessary.

4.6 Since interference avoidance requires large expenditures of engineering time and current information about existing users, several independent organizations have been established to do this work. Some equipment suppliers do this work with the aid of computers. Proposed station information is fed into the program and compatibility with the existing RF environment is evaluated. The FCC is compiling a data base for a computer program to verify compatibility of frequencies selected by the applicant with those of the existing users. The American Telephone and Telegraph Company has a computer program which is used to evaluate the interference possibilities of all proposed common carrier systems with respect to its systems. (This service is not available for general use but AT&T will cooperate with other prospective users on the suitability of frequencies which have been selected.)

5. SATELLITE SYSTEM COORDINATION CALCULATIONS

5.1 Proposed location of terrestrial microwave sites which will be operated in the frequency bands shared by satellite systems must be examined for: (1) harmful interference from existing satellite system earth station transmitters, and (2) harmful interference to existing satellite system earth station receivers. Part 25 of the FCC Rules and Regulations provides a procedure for calculating the coordination distance for each existing earth station. A showing or calculation must be submitted for each microwave site which is to be located inside of the coordination distance. The calculation must show that no harmful interference will result from the proposed station. Interference to and from a satellite is a remote possibility which should be evaluated with COMSAT as a special case.

5.2 The steps to be taken when determining the effect of a new terrestrial station consist of a series of examinations which become increasingly complex. If the first examination or step indicates no conflict, no further steps need to be taken. If the first examination shows a conflict, steps 2, 3, etc. should be examined until no conflict is anticipated. If all possibilities are utilized and a conflict remains, the proposed site must be changed and the process repeated for the new site.

5.3 This paragraph will describe the examination steps in their proper sequence.

5.31 Step 1: Compare the line of site distance between the proposed site and the nearest earth station to the "maximum coordinating distance" listed in Section 21.706d of the FCC Rules and Regulations. If the proposed station is to be located further from an existing earth station than the mileage shown in 21.706d, it may be assumed that no mutual interference will occur.

5.32 Step 2: If the proposed site is inside the "maximum coordination distance" shown in Section 21.706d of the Rules, it will be necessary to calculate the minimum basic transmission loss using actual values for transmitter powers and antenna gains. The basic calculation for which all FCC maximum coordinating distances were determined assumes the earth station antenna and the terrestrial antenna are pointed toward each other and operating on the same frequency. It also assumes a gain of 42 dB for the terrestrial antenna and a gain of 14 dB for the earth station antenna at an elevation of 5° from horizontal. If actual values are more favorable, they may be used in the basic transmission loss formula. Thus, it can be shown that terrestrial stations may be operated within the boundaries of the earth station maximum coordination distances given in Section 21.706d of the Rules.

5.33 Step 3: If the proposed location still does not have the minimum basic transmission loss, consideration should be given to (1) actual frequencies used by each user, and (2) a site shielding factor. Before attempting to use either of these as a favorable consideration, it is suggested that this matter be discussed with the FCC's engineers assigned to satellite communications coordination. The information described in paragraphs 5.31 and 5.32 is used in Figure 2 to illustrate a coordination calculation.

Fig. 1

METHOD OF DETERMINING SITE COORDINATES

EXAMPLE - 100° 45' TO 100° 50' IS EQUAL TO A 5 MINUTE DIFFERENCE IN LONGITUDE OR 300 SECONDS. SCALE IS SELECTED TO INDICATE 0-300 WHEN IT IS PLACED TO COINCIDE WITH REFERENCE LONGITUDE LINES AND SITE. READ 100° 45'+200 SECONDS OR 100° 48' 20". LATITUDE IS DETERMINED IN SIMILAR MANNER USING SCALE APPLIED TO LATITUDE REFERENCE LINES AND SITE.

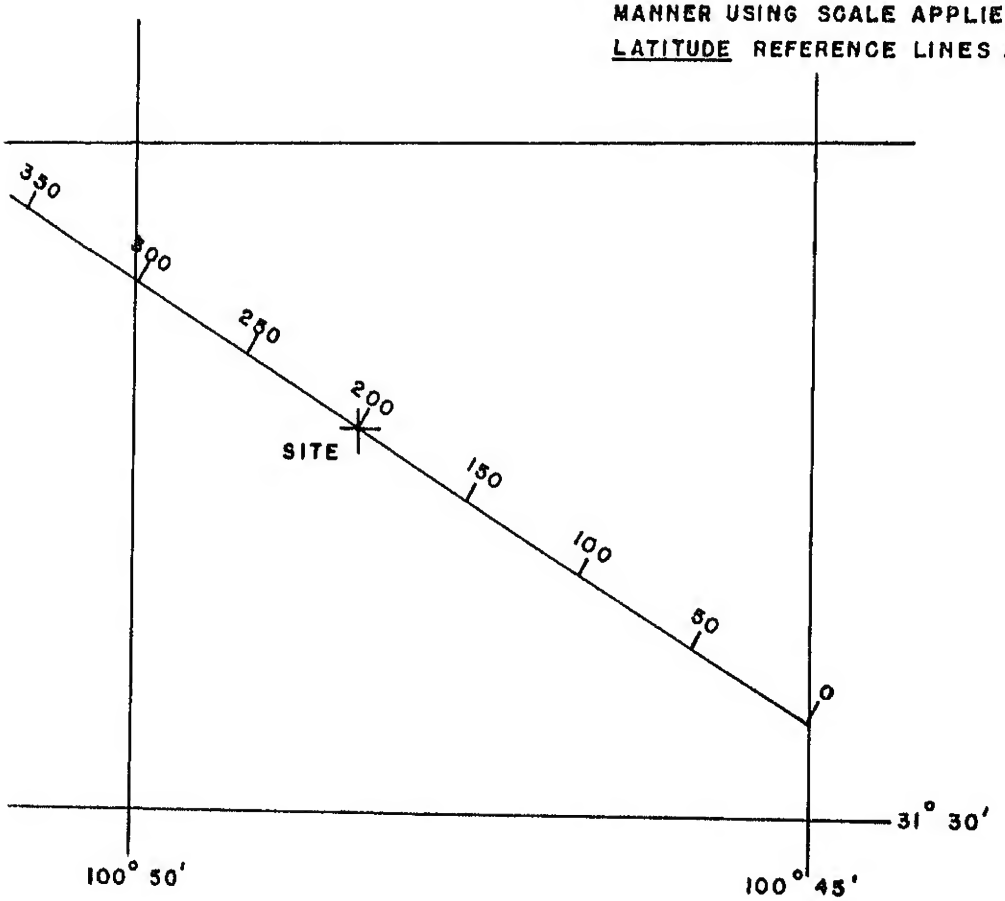

FIG. 2

SATELLITE SYSTEM COORDINATION CALCULATION

EARTH STATION TO TERRESTRIAL STATION (I)
TERRESTRIAL STATION TO EARTH STATION (II)

(I)

1. Terrestrial Station Location Lat. 38-00-01 Long. 81-17-05

2. Earth Station Location Lat. 39-16-50 Long. 79-44-13

3. Distance Between Stations 1 and 2 193 Kilometers

4. Transmitter Power Output*

   Earth Station (P_e) 18 dBw (4 kHz Bandwidth) Terrestrial Station (P_t) 0 dBw

5. Antenna Gain*

   Earth Station (G_e) 14.5 dB at 5 ° From Horizontal

   Terrestrial Station (G_t) -4 dB at 145 ° From Earth Station Bearing

6. Minimum Basic Transmission Loss - Earth Station to Terrestrial Station

   $L_b = P_e + G_e - F_s + 174$ (From Part 25.251 of F.C.C. Rules, Table 1)

   $= 18 + 14.5 - 0 + 132 + G_t$ (F_s Assumed to be 0 Except Special Cases.)

   = 160.5 dB

7. Correction From 6 GHz to 4 GHz (From Fig. 1, Part 25.251) = - 4 dB

   $L'_b = L_b + (-4)$

   = 156.5 dB

8. Coordination Distance for L'_b = 156.5 is 100 km (From Fig. 2, Part 25.251

9. Distance Between Stations Exceeds L'_b by 93 km (193-100)

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* Earth Station Power Output May be Assumed to be + 18 dBw per 4 kHz Band Unless Stated Otherwise.
Terrestrial Station Power Output is Actual Power at Antenna Input Expressed in dBw.
Earth Station Antenna Gain = 32 - 25 LOG θ (θ = ∠ of Elevation).
Terrestrial Antenna Gain Based on Its Directivity Pattern in the Horizontal Plane at the Proposed Angle From Its Main Lobe to the Earth Station Bearing. Example: Assume a 6' antenna having 39 dB gain in the forward direction and 43 dB loss at 145° (39 - 43 = -4).

FIG. 2 CONT.

SATELLITE COORDINATION DISTANCE CALCULATION (EXAMPLE)

EARTH STATION TO TERRESTRIAL STATION (I)
TERRESTRIAL STATION TO EARTH STATION (II)

(II)

1. Minimum Basic Transmission Loss (0.1%) Terrestrial Station to Earth Station

$L_b = P_t + G_t + G_e - F_s + 145$ (From Part 25.251, Table 2)

$= 0 + (-4) + 14.5 - 0 + 145$
$= 155.5$ dB

F_s is Assumed to be 0 Except Special Cases

2. Coordination Distance for $L_b = 155.5$ is 100 km (From Fig. 2, Part 25.251)

3. Distance Between Stations Exceeds L_b by 93 km

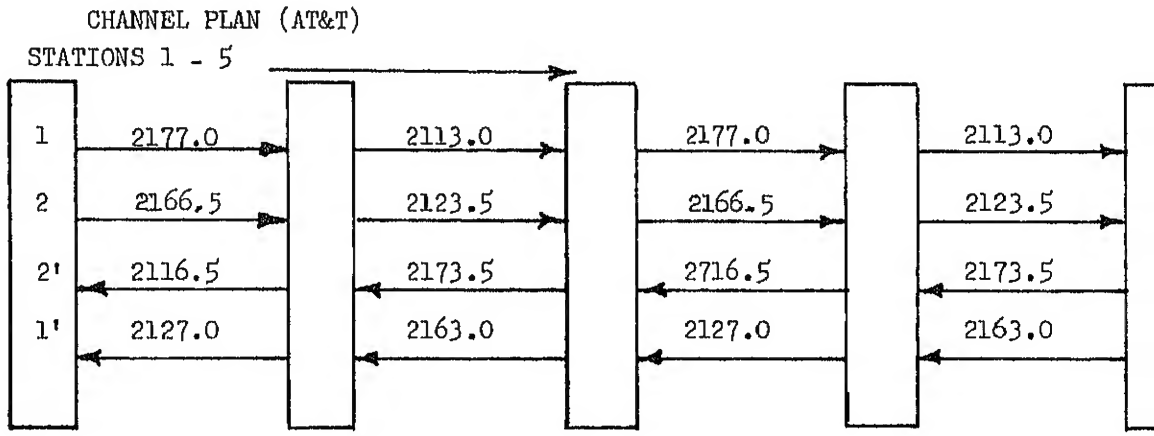
INTERFERENCE LEVELS BETWEEN STATIONS IS EXPECTED TO BE ACCEPTABLE BASED ON THESE CALCULATIONS.

FIG. 3

CHANNEL	X FREQUENCY (MHz)	Z FREQUENCY (MHz)
1	2129.0	2179
2	2118.2	2168.2
3	2125.4	2175.4
4	2114.6	2164.6
5	2121.8	2171.8
6	2111.0	2161.0
7	2128.4	2178.4
8	2126.8	2176.8
9	2125.2	2175.2
10	2123.6	2173.6
11	2122.0	2172.0
12	2120.4	2170.4
13	2118.8	2168.8
14	2117.2	2167.2
15	2115.6	2165.6
16	2114.0	2164.0
17	2112.4	2162.4
18	2110.8	2160.8
21	2127.0	2177.0
22	2123.5	2173.5
23	2120.0	2170.0
24	2116.5	2166.5
25	2113.0	2163.0

NOTES:

1. There are several 2 GHz channel pl in current use.
2. Equipment design and antenna discrimination characteristics determine suitability of all route frequency plans.



EXAMPLE OF ROUTE FREQUENCY PLAN
2 GHz
(SEE NOTES)

FIG. 4

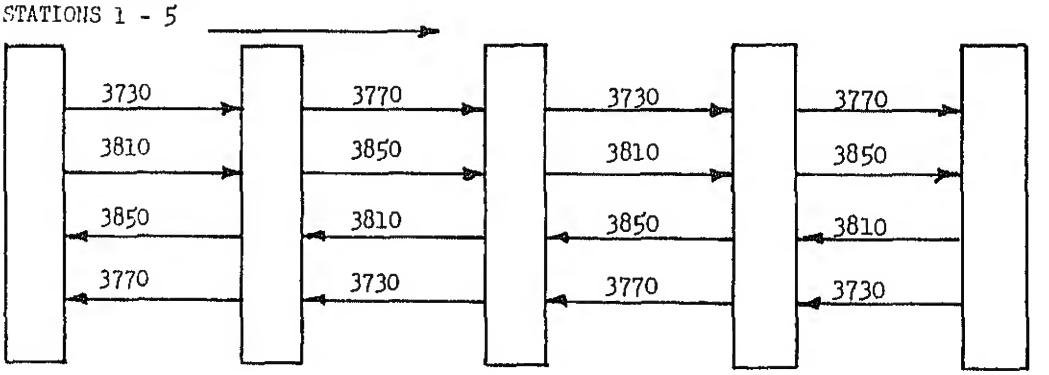
CHANNEL	A	B
	FREQUENCY (MHz)	
1	3730	3770
2	3810	3850
3	3890	3930
4	3970	4010
5	4050	4090
6	4130	4170
7	3710	3750
8	3790	3830
9	3870	3910
10	3950	3990
11	4030	4070
12	4110	4150
13	4190	4198

NOTES:

1. Sample route frequency plan shown here assumes use of separate transmit receive antennas designed for 80 dB or more front to back isolation.

2. Equipment design and antenna discrimination characteristics determine suitability of all route frequency plans.

CHANNEL PLAN (AT&T)
STATIONS 1 - 5

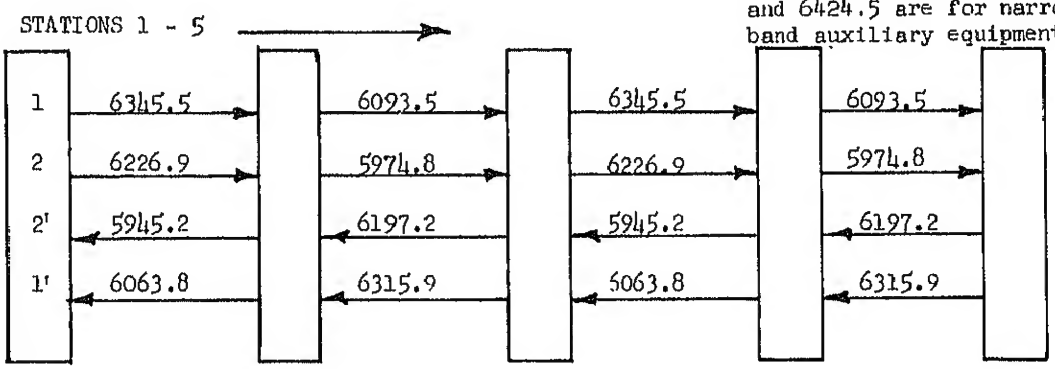


EXAMPLE OF ROUTE FREQUENCY PLAN
4 GHz
(SEE NOTES)

FIG. 5

CHANNEL	C(SPLIT)	S(STAG)	T(REG.)	U(SPLIT)
	FREQUENCY (MHz)			
10		5930.4	5925.5	
11	5937.8	5960.0	5945.2	5952.6
12	5967.4	5989.7	5974.8	5982.3
13	5997.1	6019.3	6004.5	6011.9
14	6026.7	6049.0	6034.2	6041.6
15	6056.4	6078.6	6063.8	6071.2
16	6086.0	6108.3	6093.5	6100.9
17	6115.7	6137.9	6123.1	6130.5
18	6145.3	6167.6	6152.8	6160.2
19			6172.5	
20		6182.4	6177.5	
21	6189.8	6212.0	6197.2	6204.7
22	6219.5	6241.7	6226.9	6234.3
23	6249.1	6271.4	6256.5	6264.0
24	6278.8	6301.0	6286.2	6293.6
25	6308.4	6330.7	6315.9	6323.3
26	6338.1	6360.3	6345.5	6352.9
27	6367.7	6390.0	6375.2	6382.6
28	6397.4	6419.6	6404.8	6412.2
29			6424.5	

CHANNEL PLAN (AT&T)



EXAMPLE OF ROUTE FREQUENCY PLAN
6 GHz
(SEE NOTES)

NOTES:

1. Equipment design and antenna discrimination characteristics determine suitability of all route frequency plans.

2. There are a number of channel plans in current use.

3. Frequencies 5930.4 and 6419.6 cannot be used for wideband equipment because they are too close to the edge of the band. Frequencies 6167.6 and 6.82.4 cannot be used at a 2-way repeater under some conditions because of inadequate frequency separation. Frequencies 5925.5, 6177.5 and 6424.5 are for narrow band auxiliary equipment.

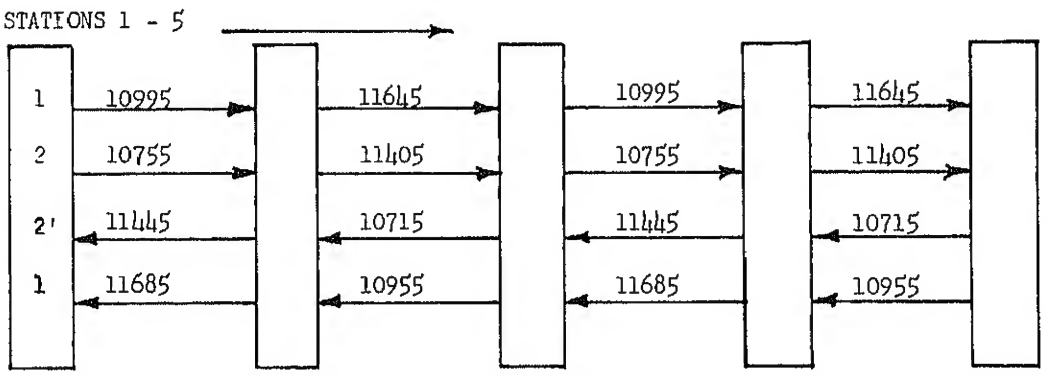
FIG. 6

	D	E	P	J
	FREQUENCY (MHz)			
1	11385	10775	10755	11405
2	11665	10975	10955	11685
3	11625	11015	10995	11645
4	11425	10735	10715	11445
5	11305	11175	11155	11325
6	11585	10895	10875	11605
7	11545	10935	10915	11565
8	11345	11135	11115	11365
9	11225	11095	11075	11245
10	11505	10815	10795	11525
11	11465	10855	10835	11485
12	11265	11055	11035	11285

NOTES:

1. Equipment design and antenna discrimination characteristics determine suitability of all route frequency plans.
2. There are a number of channel plans in current use.

CHANNEL PLAN (AT&T)

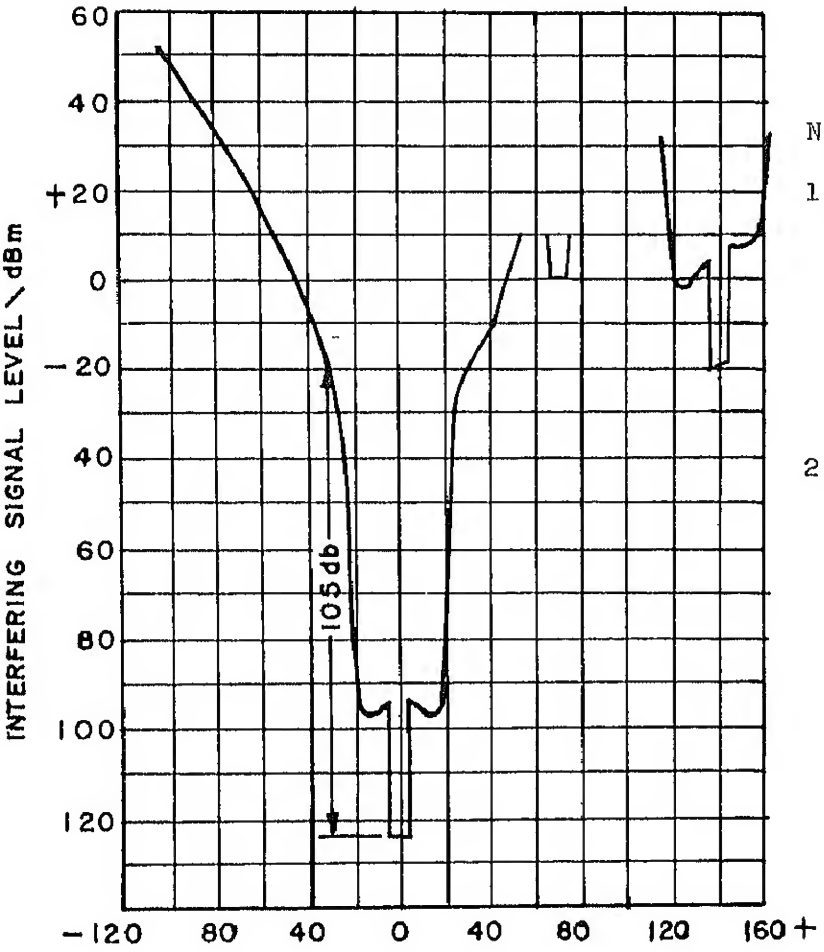


EXAMPLE OF ROUTE FREQUENCY PLAN
11 GHz
(SEE NOTES)

FIG. 7

RECEIVER SUSCEPTANCE CURVE

EXAMPLE- AN UNWANTED SIGNAL 30 MHz FROM CENTER FREQUENCY WOULD BE ATTENUATED 105 dB



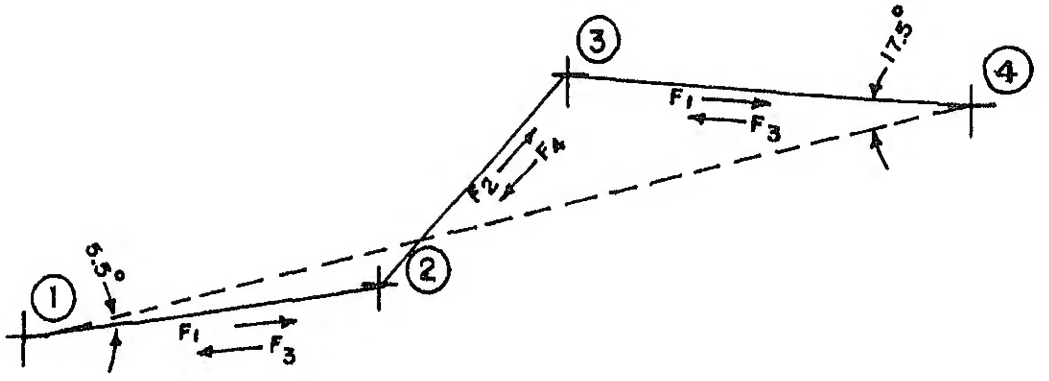
NOTES

1. Increased susceptability interference occurs at +140 MHz because the receiver LO will produce an unwanted 70 MHz I.F. signal when the LO is tuned above F_o.

2. For low side LO reverse signs on frequency scale.

FIG. 8

ILLUSTRATION OF INTRASYSTEM OVERREACH



EXAMPLE –

DOTTED LINE INDICATES PATH OF INTERFERENCE (OVERREACH)
SIGNAL FROM STATION (1) TO STATION (4)

FIG. 9

ANTENNA RADIATION PATTERN

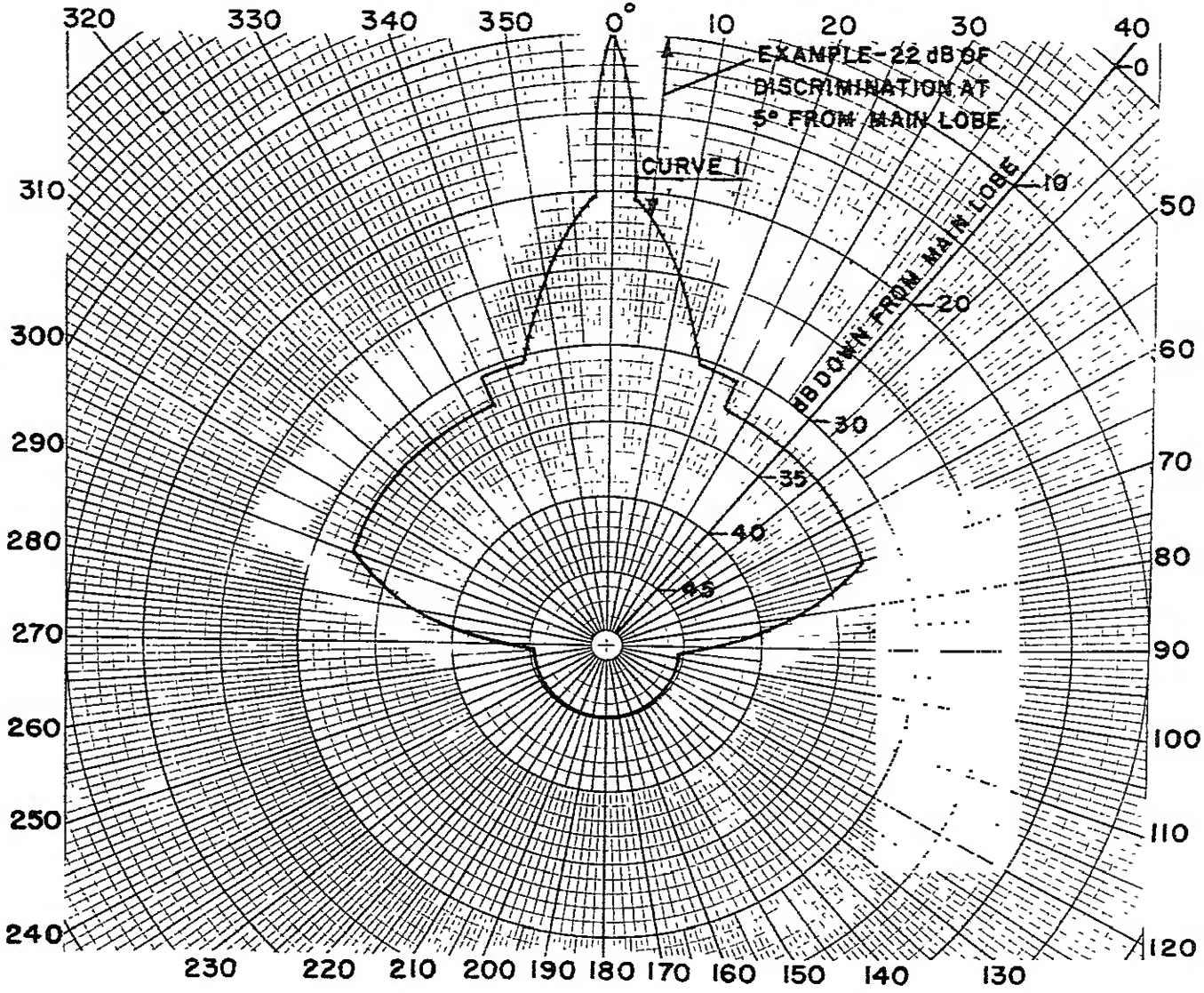
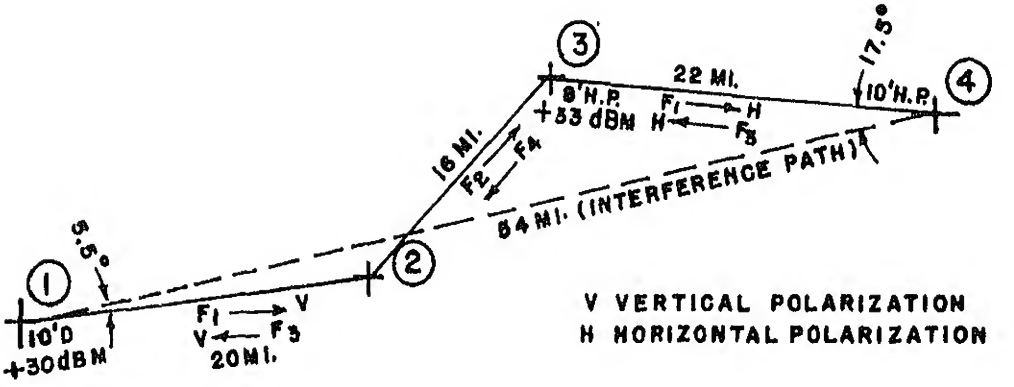


FIG. 10

FREQUENCY & INTERFERENCE DETERMINATION

Radio Path	From	Gaston (Station 3)
	To	Gander (Station 4)
Frequencies		6 GHz
Receiver Affected		Gander (Station 4)
Interfering Transmitter		Rubicon (Station 1)

The angles and distances required for the computation are as shown in the following sketch:



		Favorable	Unfavorable
1.	Disturbing transmitter antenna discrimination 10' Dish antenna 6.5° off beam	20 dB	- dB
2.	Receiving antenna discrimination 10' High Perf.(H.P.)antenna 17.5° off beam	34	-
3.	Difference in transmission paths. 54 mi vs. 22 mile path (20 log path ratio))	7.8	
4.	Difference in gain of transmit antennas 43 vs 41		2
5.	Difference in Transmitter Power Output 30 vs 33	3	
6.	Effect of Building Shielding (if any)	-	-
7.	Polarization allowance	6	-
8.	Insertion of attenuation in transmitter Feed ...	-	-
	Total	70.8 dB	2 dB
	Net Signal to Interference ratio (S/I)	68.8 dB	
	e (60 db minimum S/I Ratio) is met.		

FIG. 11

ANTENNA RESPONSE TO PARALLEL AND CROSS POLARIZED SIGNALS

CURVE 1: GUARANTEED MAXIMUM RESPONSE TO A PARALLEL POLARIZED SIGNAL
CURVE 2: GUARANTEED MAXIMUM RESPONSE TO A CROSS POLARIZED SIGNAL
CURVE 3: TYPICAL RESPONSE TO A PARALLEL POLARIZED SIGNAL
CURVE 4: TYPICAL RESPONSE TO A CROSS POLARIZED SIGNAL

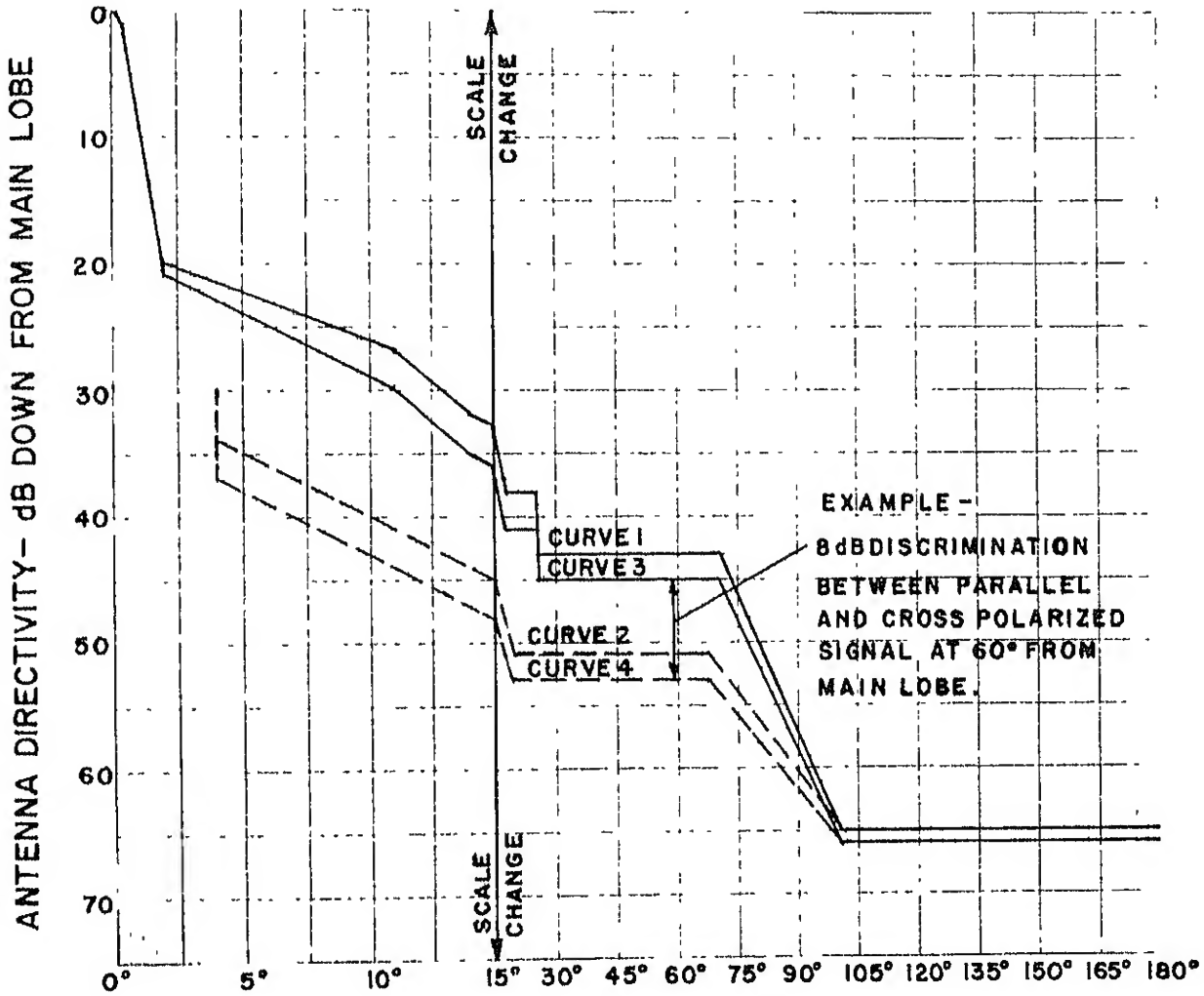


FIG. 12

METHOD OF DETERMINING 10 dB OF EARTH BLOCKING

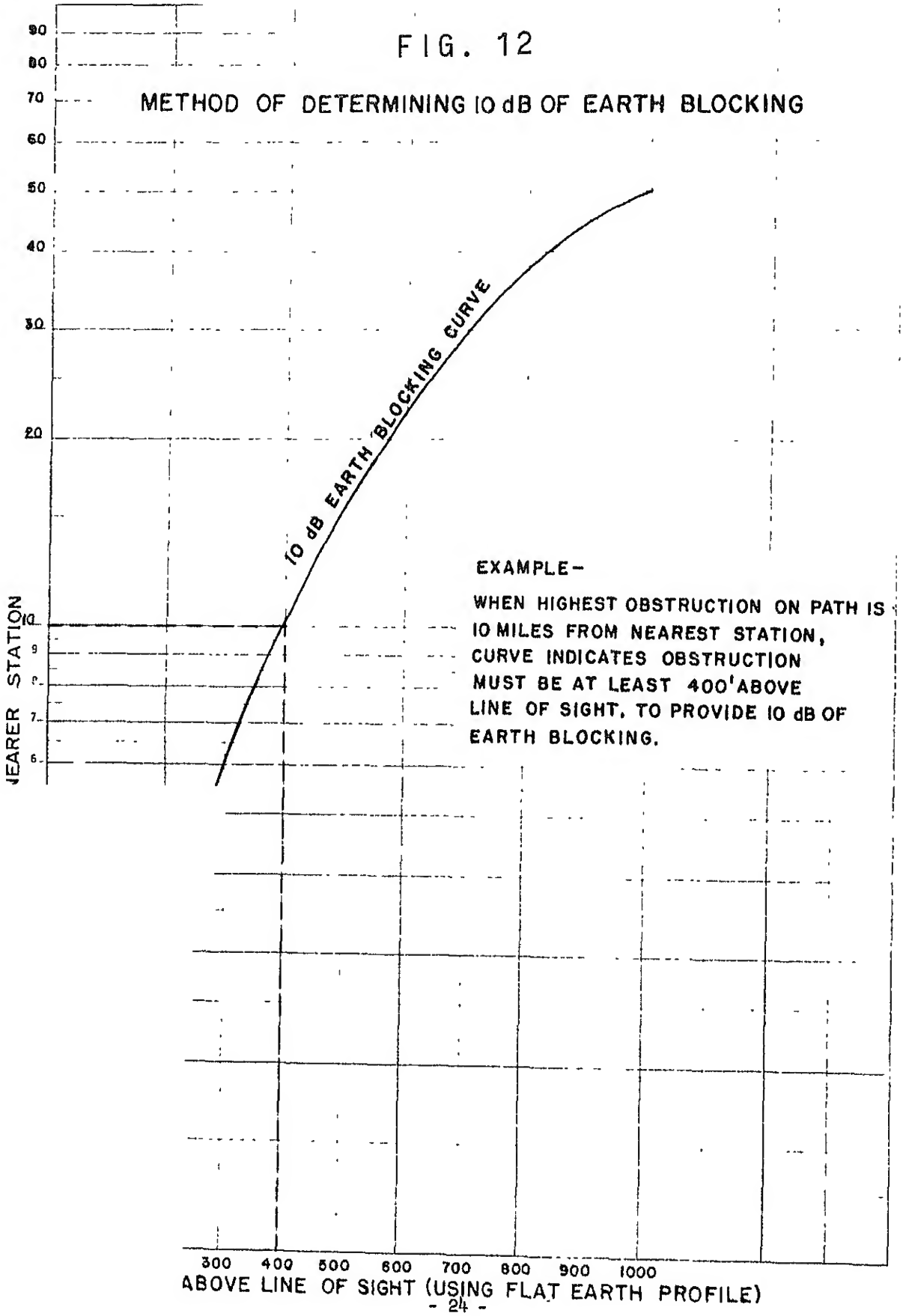
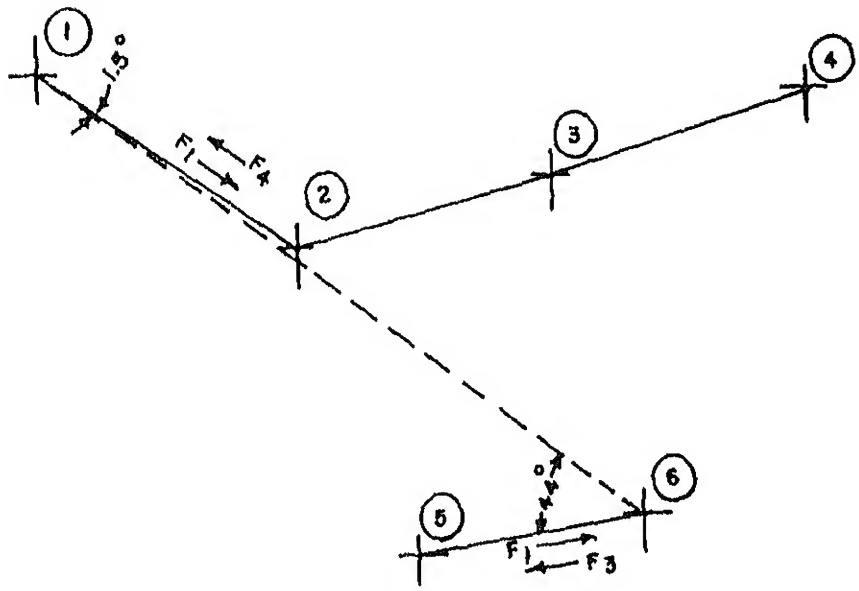


FIG. 13

ILLUSTRATION OF INTERSYSTEM OVERREACH



EXAMPLE–

DOTTED LINE INDICATES PATH OF INTERFERENCE SIGNAL FROM STATION (1) TRANSMITTER INTO STATION (6) RECEIVER.

FCC Form 401
January 1967

FEDERAL COMMUNICATIONS COMMISSION
Washington, D C. 20554

Form Approved
Budget Bureau No. 52-R043.1

APPLICATION FOR NEW OR MODIFIED COMMON CARRIER RADIO STATION CONSTRUCTION PERMIT UNDER PARTS 21 AND 25

These pages of Instructions should be removed from the attached body of the form before the form is submitted to the Commission

General Information and Instructions

1. FCC Form 401 is to be used as follows:
   A - In applying under Part 21 of FCC Rules for authority to construct a new Common Carrier Radio Station, to make changes in a licensed station that require a construction permit, or to modify an existing construction permit A separate application must be submitted for each transmitting site. However, applications for different classes of stations (other than base and mobile) may not be submitted on the same application form
   B - In applying under Part 25 of FCC Rules for an authorization for a developmental class of station in the Communication-satellite Service.

The form consists of the covering Instructions and the following pages which comprise the main body of the form.

2. Remove Instructions and submit two copies of the main body of the form (SIGN ORIGINAL COPY ONLY) to the Federal Communications Commission, Washington, D. C. 20554. (If for an Alaskan station, see next instruction)

3. If application is for an Alaskan station, submit three copies of the main body of the form (SIGN ORIGINAL COPY ONLY) to: Engineer in Charge, Federal Communications Commission, Seattle, Washington, 98104.

4. Before this application is prepared applicant should refer to Part 21 or Part 25, as applicable, of the Rules and Regulations of the Commission, copies of which may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C. 20402 Subparts B and C of Part 21 and Subpart E of Part 25 apply to all types of applicants and in certain instances may require information to be filed with an application in addition to that specified in the application form. Applicants should make every effort to file complete applications. Failure to do so can result in a rejection and return of the application or a delay in the processing of the application.

5. Enclose appropriate fee with application. DO NOT SUBMIT CASH. Make check or money order payable to Federal Communications Commission. (See Part 1 of FCC Rules to determine amount of fee to file with this application.)

Specific Instructions

6. Name of Applicant - Item 1 - If applicant is a corporation, state corporate name; if a partnership, state names of all partners and the name under which the partnership does business; if an unincorporated association, state the name of an executive officer, the office held by him, and the name of the association; if an individual, state individual's name and name under which the individual does business. If this application involves a station that is now authorized, the name herein shown should correspond with that shown on the current authorization. However, if any change in name has occurred insert new name and submit a statement explaining the change. An appropriate application for change of name in the outstanding authorizations also should be submitted where required under the Commission's Rules or the Communications Act.

7. Exhibits

   a. Supplemental Statements required by Rules: In addition to the separate statements referred to in the body of the application, various supplemental statements are required to be filed with the following applications by Parts 21 and 25 of the Commission's Rules -
      (1) Developmental - see Subpart F, Part 21
      (2) Developmental - see Subpart E, Part 25
      (3) Authorizations for service to vessels - see Subpart G, Part 21

(4) Assignment of additional channels (mobile radio service) - see Subpart G, Part 21
(5) Rural Radio Service - see Subpart H, Part 21
(6) Point-to-Point Microwave Radio Service - see Subpart I, Part 21

b. Currency of Exhibits: Each document required to be filed as an exhibit should be current as of the date of filing. If reference is made to information already on file with the Commission see item c below.

c. Reference to Information Already on File with the Commission: Where the documents or information required to be filed as exhibits, or the answers to narrative questions, are already on file with the Commission it is sufficient to include a statement setting forth the proper reference to the date of the filing and the matters in connection with which they were filed. (References to station files or applications should include call signs and file numbers, and references to docketed proceedings should include the title of the proceeding and the docket number.) A statement must be included affirming the currency of the document or information to which reference is made.

d. Numbering Exhibits: Each document or statement required to be filed as an exhibit should be numbered separately. Exhibit numbers should be shown in the blank space provided for this purpose in the individual items of the application form. Where the space left in the application for narrative answers is insufficient a separate statement, bearing an exhibit number in sequence with other exhibits numbered in the application, should be attached to the application and reference to the statement's exhibit number should be made in the answer space. ALL EXHIBITS SHOULD BE LISTED ON THE LAST PAGE OF THE FORM IN NUMERICAL SEQUENCE AND THE ITEM NUMBER OF THE FORM OR THE SECTION AND PARAGRAPH OF THE APPLICABLE RULE REQUIRING THE EXHIBIT IDENTIFIED.

8. Information Filed with the Commission should be kept current - The applicant should notify the Commission regarding any material change in the facts as they appear in the application.

9. Engineering Data -

A. In connection with the engineering portion of the application, applicants should respond to all items except in the following instances:

(a) Applicants requesting authority to operate either individual user mobile units in the Domestic Public Land Mobile Radio Service, or mobile units other than those associated with a single permanently installed base station, are NOT required to answer Items 5, 7(e), 7(g), 7(h), 10, 11, 12, 13, 14, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 32, 33(a), 40, 41, 42, 43, 44, 45, 46, 48, 50, 51, 52, or the certification at the bottom of page 3 of the Application form.
(b) Applicants for Developmental authorizations in the Communication-satellite Service need not respond to the following items: 6, 12, 13, 15, 26(a), 40, 41, 49, 52.
(c) Applicants for any class of station at temporary location (other than described in (a) above) should complete either Item 5 or 6, depending on the kind of operation proposed.
(d) Applicants for temporary-fixed station facilities pursuant to Sections 21.610 and 21.611 or 21.707 and 21.708 of Part 21 are not required to answer Items 7(g), 7(h), 10 through 15, or 19 through 26.
(e) When applicable, applicants should answer either Item 10 (control points) or 12 (alarm centers) or both depending on the applicant's proposed operation (in connection with Item 12, an alarm center is considered to be a location other than a control point at which electrical signals are received indicating operating conditions or any malfunction of equipment.)
(f) Applicants in the Point-to-Point Microwave Radio and Local Television Transmission Services are not required to answer Item 19.
(g) Item 24 should not be completed by applicants completing Items 25 and 26.
(h) Items 25 and 26 should be completed only for base stations and aeronautical ground stations communicating with stations installed in land mobile vehicles, water craft or aircraft.
(i) Only applicants for individual user units (mobile or rural subscriber) are required to submit an exhibit which includes a letter from the base station licensee with whose facility applicant intends to communicate indicating that arrangements have been made for communication with the facilities proposed. (See Item 15)

B. Each application shall be accompanied by FCC Form 401-A when the antenna structures proposed to be erected will exceed an over-all height of:

(a) 170 feet above ground level, except that where the antenna is mounted on top of an existing man-made structure, other than an antenna structure, and does not increase the over-all height of such man-made structure by more than 20 feet, or

(b) One foot above the established airport (landing area) elevation for each 200 feet of distance, or fraction thereof, from the nearest runway of nearest aircraft landing area, except that, where the antenna does not exceed 20 feet above the ground or if the antenna is mounted on top of an existing man-made structure, other than an antenna structure, or natural formation and does not increase the over-all height of such man-made structure or natural formation by more than 20 feet.

C. Each application shall be accompanied by FCC Form 714, indicating that notification has or has not been submitted to FAA, when the antenna structures proposed to be erected will extend more than 20 feet above the ground or natural formation or more than 20 feet above an existing man-made structure (other than an antenna structure).

D. The certificate at the end of the engineering section of the form is required to be signed by the technically qualified person responsible for preparation of the engineering information. In this context a "technically qualified person" is a person qualified to calculate and determine the interference potential and the efficient utilization of the proposed radio frequencies and facilities, and is thoroughly familiar with the technical requirements of the Commission. The Commission may require a statement of qualifications setting forth technical education and experience.

E. Applicants, for earth stations to be engaged in developmental operations in the Communication-satellite Service, who request the use of frequency bands which are shared with terrestrial stations on an equal basis are required to coordinate such request with authorized users in the same area. Procedures for calculating the coordination distance are contained in Section 25.251 of the Rules.

* * * * *

FCC Form 401
January 1967

Form Approved
Budget Bureau No. 52-R043.17

DO NOT WRITE IN THIS BLOCK

File No.

Call Sign

FEDERAL COMMUNICATIONS COMMISSION

Washington, D. C. 20554

APPLICATION FOR NEW OR MODIFIED COMMON CARRIER RADIO STATION CONSTRUCTION PERMIT UNDER PARTS 21 AND 25

1. Name and Post Office address of Applicant (Give street, city, state and Zip Code) (See Instruction No. 6)

2. Name of radio service in which authorization is applied for:

Class of station _____

3. Application for:

☐ New facility

and/or

☐ Change in existing authorization:

File No. ..... Call .....

4. Nature of Proposed Changes/Modifications:

[ ] Change antenna system	[ ] Add points of communication	☐ Change power
[ ] Change antenna location	[ ] Change points of communication	☐ Add control point
[ ] Change frequency	[ ] Replace transmitter	☐ Change control point location
[ ] Add frequency	☐ Add transmitter	☐ Change alarm center location
[ ] Other changes (specify)		

ENGINEERING DATA (See Instruction 9.)

5. Location of transmitting antenna

City or Town	County	State

Exact antenna location (street address) (If in area not designated by street, give distance and direction from, and name of nearest town)

Geographic coordinates (to be determined in nearest second)

North Latitude	West Longitude
° ' "	° ' "

6. If application is for individual mobile user unit, or for mobile units other than those associated with a single permanently installed base station, or for any other class of station at temporary locations, show area of operation. (See instruction 9-A(b)).

7. Particulars of operation of the proposed station (See Instruction 9(a) & (d))

(a) Frequency (Mc/s)	(b) Emission Designator	(c) Transmitter Power (Watts) Input	(c) Transmitter Power (Watts) Output	(d) Maximum Modulating Frequency (cycles/sec)	(e) (For Telegraph Type Emissions) Maximum Transmission Speed (bauds)	(f) (Check One) Polarization Plane of Radiated Signal Vertical	(f) (Check One) Polarization Plane of Radiated Signal Horizontal	(g) Azimuth of Radio Path (True Bearing)	(h) Length of Radio Path	(i) Points of Communication
								° '	km	
								° '	km	
								° '	km	
								° '	km	
								° '	km	
								° '	km	
								° '	km	
								° '	km	

8. Transmitters

(a) No. of Transmitters	(b) Make of transmitters	(c) Transmitter Type or Model No.	(d) Frequency Stability	(e) Emission Designator	(f) Class of Station
			%		
			%		
			%		
			%		
			%		

9. By what means will the transmitter(s) be rendered inaccessible to unauthorized persons?

B. Each application shall be accompanied by FCC Form 401-A when the antenna structures proposed to be erected will exceed an over-all height of:

(a) 170 feet above ground level, except that where the antenna is mounted on top of an existing man-made structure, other than an antenna structure, and does not increase the over-all height of such man-made structure by more than 20 feet, or

(b) One foot above the established airport (landing area) elevation for each 200 feet of distance, or fraction thereof, from the nearest runway of nearest aircraft landing area, except that, where the antenna does not exceed 20 feet above the ground or if the antenna is mounted on top of an existing man-made structure, other than an antenna structure, or natural formation and does not increase the over-all height of such man-made structure or natural formation by more than 20 feet.

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E. Applicants, for earth stations to be engaged in developmental operations in the Communication-satellite Service, who request the use of frequency bands which are shared with terrestrial stations on an equal basis are required to coordinate such request with authorized users in the same area. Procedures for calculating the coordination distance are contained in Section 25.251 of the Rules.

* * * * *

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1. Name and Post Office address of Applicant (Give street, city, state and Zip Code) (See Instruction No. 6)

2. Name of radio service in which authorization is applied for.

Class of station _____

3. Application for:

☐ New facility

and/or

☐ Change in existing authorization.

File No. ..... Call .....

4. Nature of Proposed Changes/Modifications:

[ ] Change antenna system
[ ] Change antenna location
[ ] Change frequency
[ ] Add frequency
[ ] Other changes (specify)

[ ] Add points of communication
[ ] Change points of communication
[ ] Replace transmitter
[ ] Add transmitter

☐ Change power
☐ Add control point
☐ Change control point location
☐ Change alarm center location

ENGINEERING DATA (See Instruction 9.)

5. Location of transmitting antenna

City or Town	County	State

Exact antenna location (street address) (If in area not designated by street, give distance and direction from, and name of nearest town)

Geographic coordinates (to be determined in nearest second)

North Latitude ° ' "

West Longitude ° ' "

6. If application is for individual mobile user unit, or for mobile units other than those associated with a single permanently installed base station, or for any other class of station at temporary locations, show area of operation (See instruction 9-A(b)).

7. Particulars of operation of the proposed station (See Instruction 9(a) & (d))

(a) Frequency (Mc/s)	(b) Emission Designator	(c) Transmitter Power (Watts) Input	(c) Output	(d) Maximum Modulating Frequency (cycles/sec.)	(e) (For Telegraph Type Emissions) Maximum Transmission Speed (bauds)	(f) (Check One) Polarization Plane of Radiated Signal Vertical	(f) Horizontal	(g) Azimuth of Radio Path (True Bearing) °	(h) Length of Radio Path	(i) Points of Communication
								0 '	km	
								0 '	km	
								0 '	km	
								0 '	km	
								0 '	km	
								0 '	km	
								0 '	km	
								0 '	km	

8. Transmitters

(a) No. of Transmitters	(b) Make of Transmitters	(c) Transmitter Type or Model No.	(d) Frequency Stability	(e) Emission Designator	(f) Class of Station
			%		
			%		
			%		
			%		
			%		

9. By what means will the transmitter(s) be rendered inaccessible to unauthorized persons?

FCC FORM 401

10. Location of Control Point(s) 1/ 2/

Number and Street

City or Town | State

Can transmitter(s) be placed in an inoperative condition from this control point?

☐ Yes ☐ No

Specify hours control point will be staffed by operating personnel

☐ Continuous ☐ Limited hours (specify)

11. Describe the means by which personnel at the control point can determine when there is a deviation from the terms of the station authorization or when operation is not in accordance with the Commission's rules governing the class of station involved. 1/ 2/

12. Location of Alarm Center 1/ 2/ 3/

Number and Street

City or Town | State

Can transmitter(s) be placed in an inoperative condition from this alarm center?

☐ Yes ☐ No

Specify hours alarm center will be staffed by operating personnel

☐ Continuous ☐ Limited hours (specify)

13. Describe the means by which personnel at the alarm center can determine when there is a deviation from the terms of the station authorization or when operation is not in accordance with the Commission's rules governing the class of station involved. A brief description of each automatic alarm proposed to be used should be included 1/ 2/ 3/

14. Will radio facilities be used to connect either control point(s) or alarm center(s) to transmitter(s)? 1/ 2/

☐ Yes ☐ No

If "Yes", identify radio facilities:

15. Applicants for individual user units should attach as Exhibit _____ the showing required by Section 21.15(l) of Part 21 (See Instruction 9(i)) 2/ 3/

16. Do Proposed radio facilities contemplate multiplex type of transmission? 1/

☐ Yes ☐ No

If authorization for the channelizing equipment has previously been granted by the Commission, or is being requested under separate application, specific reference thereto should be made herein

17. Transmitting antenna 1/

Make | Type No.

Maximum antenna power gain over reference half-wave dipole antenna

decibels

18. Radiation characteristics of installed antenna system 1/

☐ Non directional in horizontal plane

☐ Directional in horizontal plane with center of main lobe of radiation directed _____ degrees _____ minutes clockwise from true North

Directional antenna pattern (polar diagram) showing power distribution (expressed in decibels of power gain over a reference half-wave dipole antenna) of signal radiated in the horizontal plane is attached hereto as Exhibit No. _____

19. Antenna transmission line data 1/ 2/

Make	Type No.	Length (feet)	Total Loss (decibels)

20. Description of transmitting antenna structure (Heights given should include obstruction light, if required, and any other surmounting appurtenance) 1/ 2/

Overall height in feet above ground	Overall height in feet above mean sea level

Submit, as Exhibit No. _____, a vertical profile sketch of total structure (including supporting building, if any) giving heights in feet above ground for all significant features. Clearly indicate existing portion, noting particulars of aviation obstruction lighting already prescribed.

21. Will proposed transmitting antenna be supported by the antenna structure of any other radio station? 1/ 2/

☐ Yes ☐ No

22. Distance from transmitting antenna structure to nearest runway of nearest aircraft landing area _____ feet. 1/ 2/

23. List any natural formation or existing man made structure (hills, trees, water tanks, tower, etc.) which applicant believes would tend to shield the antenna structure from aircraft and thereby minimize the aeronautical hazard of the antenna structure 1/ 2/

mobile units other than those associated with a single permanently installed base station.

ant to Sections 21.610 and 21.611 or 21.707 and 21.708, this item need NOT be answered. T be answered.

24. Topographic data for fixed stations 1/ 2/

Attach, in duplicate as Exhibit No.____, a topographic map (a U.S. Geological Survey quadrangle or map of comparable detail and accuracy) with the exact location of the proposed station drawn and identified thereon. In cases where FCC Form 401-A, is required to be filed, such map must be furnished in triplicate and should be attached to such Form.

25. Topographic data for base and aeronautical ground stations 1/ 2/

(a) Attach, in duplicate as Exhibit No.____, topographic Map(s) (U.S. Geological Survey quadrangles or maps of comparable detail and accuracy) for the area within 10 miles of the proposed transmitter location and draw thereon the following:

(1) Proposed transmitting antenna location plotted accurately to the nearest second of Latitude and Longitude.

(2) Eight uniformly spaced radials each extending to a distance of ten or more miles from the proposed transmitting antenna location in addition to radials in direct line with each co-channel station within 75 miles.

(b) Attach, as Exhibit No.____, profile graphs with reasonably large scales for the radials in (a) (2) above. Each graph shall show the ground elevation along the radial and the elevation of the antenna radiation center. Identify each graph by its azimuth bearing from the proposed antenna location. Direction of True North shall be zero azimuth, azimuths of other radials shall be measured clockwise from True North. Show source of topographical data on each graph.

26.(a) From the profile graphs in 25(b) for the eight mile distance between two and ten miles from the proposed transmitting antenna location, and in accordance with the procedure prescribed in the Commission's rules, supply the following tabulation of data: 1/ 2/ 3/

Radial Bearing (Degrees True)	Average Elevation of Radial (2 10 mi.) in Feet Above Mean Sea Level	Height of Antenna Radiation Center in Feet Above Average Elevation of Radial (2 10 miles)	Effective Radiated Power in Radial Direction (watts)
0°			
45°			
90°			
135°			
180°			
225°			
270°			
315°			
(*)			
(*)			
(*)			

Average Terrain Elev ____ ft | Antenna Radiation Center Height in Feet Above Average Terrain:

(*) Radials in direction of each co-channel station within 75 miles. Do not include in determination of average terrain elevation

26.(b) For any antenna associated with a communication satellite earth station, show the minimum elevation proposed to be used.____ degrees.

27. Location of Fixed Antennas Receiving Signals of This Station 1/ 4/

(a) City or Town	County	State

Geographic coordinates (to be determined to nearest second)

North Latitude	West Longitude
° ' "	° ' "

(b) City or Town	County	State

North Latitude	West Longitude
° ' "	° ' "

(c) List frequencies, call letters, and location of stations to be regularly received by station described in Item 5

28. Frequency measurements

(a) What provision will be made for measurement and periodic checking of the station frequency?

(b) If a frequency measuring device is not to be provided, give name and address of frequency checking agency to be employed by applicant

(If frequency checking agency is shown above, the succeeding subparagraphs of this question are not to be answered)

(c) What type of frequency measurement or calibration apparatus will be used?

(d) Within how many cycles or within what percentage will this apparatus measure the frequency?

(e) What methods will be used to check calibration of this precision instrument?

(f) How often will calibration of this instrument be checked?

CERTIFICATION OF PERSON RESPONSIBLE FOR PREPARING 1/
Engineering Information Submitted in this Application

I hereby certify that I am the technically qualified person responsible for preparation of the engineering information contained in this application, that I am familiar with Parts 21 or 25 of the Commission's Rules, that I have either prepared or reviewed the engineering information submitted in this application; and, that it is complete and accurate to the best of my knowledge.

By _____ (signed) _____ (printed) Dated this ____ day of _____, 19____

Address: Number Street City State

WILLFUL FALSE STATEMENTS MADE ON THIS FORM ARE PUNISHABLE BY FIN. AND/OR IMPRISONMENT U.S. CODE TITLE 18 SECTION 1001

1/ If application is for individual user mobile unit, or for mobile units other than those associated with a single permanently installed base station, this item need NOT be answered.
2/ If application is for temporary-fixed station facilities pursuant to Sections 21.610 and 21.611 or 21.707 and 21.708, this item need NOT be answered.
3/ If application is filed under Part 25 this question need NOT be answered.
4/ If communication with one or more foreign countries is proposed, identify the country(ies) and complete applicable parts of Item 27.

FCC Form 401 — LEGAL AND OTHER DATA — Page 4

29. Applicant is: (check one)
☐ Individual ☐ Partnership ☐ Corporation ☐ Unincorporated Association

(X yes or no)	YES	NO
30. Is individual Applicant or each member of a partnership Applicant a citizen of the United States?		
31. Is Applicant or any party to this application a representative of an alien or of a foreign government?		
32. If Applicant is a Partnership, attach as EXHIBIT_____, one copy, properly certified, of the partnership agreement, or if oral, complete details thereof.		
33. If Applicant is a Corporation (Including Joint stock Companies) or Association, answer the following:		
a. Under laws of what State or Country is it organized? 1/ _____ (1) Attach as EXHIBIT(s)_____ a certified copy of the Articles of Incorporation (charter) and the By-Laws. (2) Attach as EXHIBIT_____ the names, addresses and percentages held of all stockholders owning and/or voting 10 percent or more of applicant's stock.		
b. Give address of applicant's principal office: _____		
c. Is any director or officer an alien?		
d. Is more than one-fifth of the capital stock or membership interest voted by aliens or their representatives, or by a foreign government or representative thereof, or by any corporation organized under the laws of a foreign country?		
e. Is Applicant directly or indirectly controlled by any other corporation? (If "Yes" give names and addresses of all such controlling corporations including organization having final control.)		
f. Is the Applicant directly or indirectly controlled by any other corporation of which any officer or more than one-fourth of the directors are aliens? (If "Yes", attach as EXHIBIT_____ a statement relating the facts)		
g. Is more than one-fourth of the capital stock of any controlling corporation owned of record, or may it be voted by aliens or their representatives, or by a foreign government or representative thereof, or by any corporation organized under the laws of a foreign government? (If "Yes", attach as EXHIBIT_____ a statement relating the facts)		
h. Under laws of what State or country is each such controlling corporation organized? _____ (Attach as EXHIBIT(s)_____ a certified copy of the Articles of Incorporation (Charter) and the By-Laws)		
34. Has applicant or any party to this application had any FCC station license or permit revoked or had any application for permit, license or renewal denied by this Commission? (If "Yes", attach as EXHIBIT_____ a statement giving call sign of license or permit revoked and relate circumstances)		
35. Has any court finally adjudged the applicant, or any person directly or indirectly controlling the applicant, guilty of unlawfully monopolizing or attempting unlawfully to monopolize radio communication, directly or indirectly, through control of manufacture or sale of radio apparatus, exclusive traffic arrangement, or any other means or of unfair methods of competition? (If "Yes", attach as EXHIBIT_____ a statement relating the facts)		
36. Has the applicant, or any party to this application, or any person directly or indirectly controlling the applicant ever been convicted of a crime for which the penalty imposed was a fine of $500 or more, or an imprisonment of six months or more? (If "Yes", attach as EXHIBIT_____ a statement relating the facts)		
37. Is applicant, or any person directly or indirectly controlling the applicant, presently a party in any matter referred to in Items 34, 35 and 36? (If "Yes", attach as EXHIBIT_____ a statement relating the facts)		
38. Is applicant directly or indirectly, through stock ownership, contract, or otherwise currently interested in the ownership or control of any other radio stations licensed by this Commission? If "Yes", give:		
39. Has applicant ever been directly or indirectly interested in the ownership or control of any radio stations other than those stated in 38 above? If "Yes", give		

Call Sign & Service	Location	Name of Licensee

1/ If application is for individual user mobile unit, or for mobile units other than those associated with a single permanently installed base station, this item need NOT be answered.

	YES	NO
40. Will applicant offer communication services to the public 24 hours every day? 1/ 2/		
If "No", state hours and days during which station will be open for such service		
Hours:		
Days:		
41. Are the charges for the proposed service contained in a tariff filed with the FCC? 1/ 2/		
If "Yes", identify: _____		
If "No", attach as EXHIBIT _____ a schedule of proposed charges.		
(The statement of rates required herein does not constitute a filing of schedules of charges required by Section 203 of the Communications Act of 1934, as amended, prior to commencing service.)		
42. Does local or state law require any franchise or other authorization to maintain or render the services proposed herein? 1/		
(If "Yes", attach as EXHIBIT _____ a single certified copy of franchise or authorization)		

43. If application is for modification of a construction permit. 1/

(a) The time required to complete construction after authority is granted is _____ months.

(b) Attach as EXHIBIT _____ a statement giving: (1) the extent of construction as of the date of this application, and (2) the justification for not having completed construction in accordance with outstanding construction permit.

44. In what businesses, employment or activities, other than communications common carrier, are applicant and its principals engaged? 1/

(Attach as EXHIBIT _____ a statement giving the following for each such activity:

(a) nature of activity
(b) location of activity
(c) hours devoted to each activity

45. What is applicant's relation to station? 1/

[ ] Owner [ ] Lessee [ ] Other

(Attach as EXHIBIT _____ copies of all agreements affecting applicant's ownership, operation, use and/or control of the station facilities.)

46. Is applicant directly or indirectly interested in or affiliated with any entity or person engaged in the business of providing a public land line message telephone service. 1/ [ ] Yes [ ] No

(If "Yes", and applicant is not a landline telephone carrier, attach as EXHIBIT _____ a statement relating the facts)

47. Estimated cost to establish proposed facilities.

a. Transmitter(s) and receiver(s)	$_____
b. Antenna(s) and waveguide or antenna transmission line(s)	$_____
c. Power plant, control, and common equipment	$_____
d. Land, buildings, towers, etc.	$_____
e. Channelizing equipment	$_____
f. Miscellaneous	$_____
Total cost	$_____

48. Attach as EXHIBIT _____ a statement showing applicant's financial ability to construct and operate this station. Include the most recent balance sheet of the applicant (must be as of a date at least within 90 days of the filing of this application.) If loans or other credit arrangements are contemplated, duplicate copies of written instruments, other than demand notes, must be submitted. (Copies of standard manufacturer's lease or sales agreements on file with the Commission need not be submitted but should be identified by manufacturer's name and form number, and the material terms and conditions should be outlined.) Names and addresses of all parties to financial agreements must be stated. Oral agreements must be summarized and details submitted with regard to all material terms thereto. 1/

49. Attach as EXHIBIT _____ a statement of the number and description of all technical personnel to be employed directly by licensee for maintaining and repairing the proposed facilities, and describing the specific arrangements for prompt maintenance or repair of the proposed facilities. 2/

50. Attach as EXHIBIT _____ a detailed statement covering the manner in which the proposed service will be operated, including number of persons to be so employed, division of work, and hours of physical supervision by applicant. If facilities are to be operated and/or maintained in conjunction with any other business, give name and address of owner of such business and submit copies of working agreements. 1/

1/ If application is for individual user mobile unit, or for mobile units other than those associated with a single permanently installed base station, this item need NOT be answered.

2/ If application is filed under Part 25 this question need NOT be answered.

51. Applicants not engaged in providing public wire line communication service shall attach as EXHIBIT_____ a statement showing the extent to which the applicant intends actively to participate in the day-to-day operation of the proposed facilities. In the event the applicant does not intend actively to participate in the day-to-day mangement and operation, he should state his reasons therefor and fully disclose the details of the proposed operations, including a showing of how control thereof will be retained by the applicant. The statement shall also set forth the names and addresses of any and all persons (except applicant) who have a substantial interest or responsibility in the supervision, operation, maintenance and/or control of proposed facilities, the relationship of each such person to the applicant and the extent of control to be exercised by such persons. 1/

52. Attach as EXHIBIT_____ a complete statement, setting forth facts which show how the instant proposal will be in the public interest and will satisfy specified needs for service, detailing the number and activities of prospective customers and disclosing all relationships, affiliations or connections between the applicant and prospective customers. If surveys or solicitations have been made, the nature and detailed results thereof should be submitted. The statement should contain the names of any common stockholders, officers, directors, employees or individuals closely related to the management or control of the facilities of the applicant or any subscriber. Applications for authorizations in the Point-to-Point Microwave Radio service proposing the rendition of service to community antenna television systems should include a statement indicating whether or not the proposed customers have obtained whatever necessary local authorizations are required for the operation of the CATV systems. 1/ 2/

53. Is applicant personally familiar with the provisions of Part 21 or 25, as applicable, of the Commission's Rules? ☐ Yes ☐ No

EXHIBITS AND APPLICABLE SEC. and/or ITEM NO. OF RULE OR FORM (See Instruction 7)

Exhibit Number	Sec and or Item No of Rule or Form	Exhibit Number	Sec and/or Item No of Rule or Form	Exhibit Number	Sec and or Item No of Rule or Form

CERTIFICATION

The APPLICANT waives any claim to the use of any particular frequency or of the ether as against the regulatory power of the United States because of the previous use of the same, whether by license or otherwise, and requests a construction permit in accordance with this application. All statements made in the attached exhibits are a material part hereof and are incorporated herein as if set out in full in this application. The undersigned, individually and for the applicant, hereby certifies that the statements made in this application are true, complete and correct to the best of his (her) knowledge and belief, and are made in good faith.

Dated this_____ day of_____, 19_____.

WILLFUL FALSE STATEMENTS MADE ON THIS APPLICATION ARE PUNISHABLE BY FINE AND IMPRISONMENT (U S Code Title 18 Section 1001) AND OR REVOCATION OF ANY STATION LICENSE OR CONSTRUCTION PERMIT (U S Code Title 47 Section 312(a)(1))

Applicant _____
(must correspond with that shown on page 1)

By _____ _____
(printed) (signed)

Title _____
(position held by person signing for applicant)

1/ If application is for individual user mobile unit, or for mobile units other than those associated with a single permanently installed base station, this item need NOT be answered.
2/ If application is filed under Part 25 this question need NOT be answered.

FCC Form 403 May 1967	Form Approved Budget Bureau No. 52-R046.14	APPLICANT SHOULD NOT USE THIS BLOCK	
		File Number	Call Sign

Federal Communications Commission
Washington, D. C. 20554

APPLICATION FOR RADIO STATION LICENSE OR MODIFICATION THEREOF UNDER PARTS 5, 21, 23, 25, 81, 83, or 85

INSTRUCTIONS

A. Submit ONE COPY of this application (when filing under Part 21 submit TWO COPIES) direct to the Federal Communications Commission, Washington, D. C. 20554, for radio licenses in the following services (SUBMIT ONE ADDITIONAL COPY OF APPLICATION WHEN RULES REQUIRE FILING IN FCC FIELD OFFICE IN SEATTLE, WASHINGTON):

FCC Rules Part 5 - Experimental Radio Services (Other than Broadcast)

FCC Rules Part 21 - Domestic Public Radio Services (Other than Maritime Mobile)

FCC Rules Part 23 - International Fixed Public Radiocommunication Services

FCC Rules Part 25 - Satellite Communications

FCC Rules Part 81 - Stations on Land in the Maritime Services

FCC Rules Part 83 - Stations on Shipboard in the Maritime Services

FCC Rules Part 85 - Public Fixed Stations and Stations of the Maritime Services in Alaska

B. It is recommended that, before submitting application, applicant refer to the appropriate rule part which governs the class of station applied for. Copies of the rules may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C. 20402.

C. Use additional sheets where necessary. Such sheets must be marked as exhibits and referred to in the application

D. Enclose appropriate fee with application, if required DO NOT SEND CASH. Make check or money order payable to Federal Communications Commission. See rules parts listed in paragraph "A" above to determine whether a fee is required with this application.

1(a) Name of Applicant:

(b) Mailing Address (number, street, city, state, Zip Code):

2(a) Class of Station and Call Sign:

(b) Nature of Service

(c) Purpose of application:

License to cover construction permit [ ]

Modification of License [ ]

Present File No. _____

(d) If for modification of license indicate proposed change:

Change in frequencies [ ]

Change in authorized power [ ]

Change(s) of control point(s) [ ]

Change in points of communication [ ]

Change in other particulars [ ]
(Describe under Remarks on Page 4)

3(a) List the outstanding construction permit(s), if any, which this application covers:

File Number	Date	Call Sign	Manufacturer of Transmitter	Type No.	Serial No.

(*b*) If licensed transmitters are being deleted or replaced, show the following with respect to such transmitters:

Manufacturer	*Type No.*	*Serial No.*

(*c*) When was the construction specified in 3(*a*) completed? . . . . . .

(*d*) Is the station now ready for operation? . . . . . YES ☐ NO ☐

(*e*) Have all the terms of the construction permit(s) listed in 3(*a*) been met? . . . YES ☐ NO ☐

(*f*) Are all the statements made in the applications for the construction permits or the modifications thereof mentioned in 3(*a*) still true as of the date of this application? . . . . . YES ☐ NO ☐

(*g*) If the answer to either or both 3(*d*) and 3(*e*) above is "no", the discrepancies must be shown in appropriate places in this form or listed separately in exhibits and submitted as a part of this form.
Indicate method of submission below:
Numbers of paragraphs containing corrected data . . . . . .
Identification of exhibits containing corrected data . . . . . .

4. Specify in the table *all* particulars of operation exactly as they are desired in the license or modification thereof.

(1) Frequencies	(2) Hours	(3) Power	(4) Emission	(5) Modulating Frequency (Cycles)	(6) Transmission Speed (Bauds)	(7) Points of Communication

COLUMN NOTES:

(1) List all frequencies, indicating whether kilocycles or megacycles, and polarization of radiated signal.
(2) Indicate as unlimited, day only, continuous, etc. (This item refers to intended hours of use of the specific frequency.)
(3) Specify whether watts or kilowatts. In the Experimental Radio Services specify effective radiated power and in case of pulse

ach frequency. Describe special emission in space below.
ach type of emission involved.
ed in normal operation opposite each type of emission involved. To convert transmission
tiply the number of words per minute by 0.8
point of communication.

5. If this application is for authority to operate with *an operator on duty at control point(s) other than the transmitter location* -

(*a*) What will be the location of the control point(s)?

State _____ County _____

City or Town _____ Street and No. _____

(*b*) What will be the airline distance between transmitter location and the control point(s)? _____

(*c*) By what means will the station be monitored while in operation?

_____

_____

(*d*) Can the transmitter be shut down by the licensed operator at the control point so as to prevent operation from other point(s)? . . . . . YES ☐ NO ☐

(*e*) How will unauthorized persons be prevented from having access to the transmitter?

_____

_____

6. Proposed location of transmitter:

(*a*) *If portable:* ☐ *mobile:* ☐ *(check one, if applicable)* give geographical area of proposed operation:

_____

_____

(*b*) If permanently located at a fixed location, give:

State _____ County _____

City or town _____ Street and number _____

N. Latitude: Degrees _____, minutes _____, seconds _____

W. Longitude: Degrees _____, minutes _____, seconds _____
(Give latitude and longitude correct to seconds)

7. Note any alteration in transmitter(s) or antenna systems not previously reported to the Commission.

_____

_____

8. (*a*) Have there been any changes in the data furnished in the application for construction permit covering ownership, citizenship, station control, business connections, and monopolistic practices? . . . . . YES ☐ NO ☐

(*b*) Have such changes been reported to the Commission? If not, such data must be submitted herewith . . . . . YES ☐ NO ☐

9 *(a)* Is station to be open to public correspondence? YES ☐ NO ☐

If so, state hours during which station will be open for such service

(b) Will any charge be made for handling public correspondence? YES ☐ NO ☐

If so, state schedules of charges
The statement of rates required herein does not constitute a filing of schedules of charges required by Section 203 of the Communications Act of 1934, as amended, prior to commencing service

(c) State basis of division of charges with other stations

10 If this application is for modification of license, state why the proposed change(s) is (are) deemed necessary and the purpose(s) it will serve.

THE APPLICANT hereby waives any claim to the use of any particular frequency or of the ether as against the regulatory power of the United States because of the previous use of the same, whether by license or otherwise, and requests a station license in accordance with this application.

All the attached exhibits are a material part hereof and are incorporated herein as if set out in full in the application. All the answers on this application are a material part of the application.

CERTIFICATION

I certify that the statements in this application are true, complete, and correct to the best of my knowledge and belief, and are made in good faith.

Signed and dated this____day of_____, 19____

_____
Name of Applicant *(must correspond with item 1a)*

By_____
Signature *(designate by checkmark below appropriate classification)*

WILLFUL FALSE STATEMENTS MADE ON THIS FORM ARE PUNISHABLE BY FINE AND IMPRISONMENT. U. S. CODE, TITLE 18, SECTION 1001.

☐ INDIVIDUAL APPLICANT
☐ MEMBER OF APPLICANT PARTNERSHIP
☐ OFFICER OF APPLICANT CORPORATION OR OFFICER AND MEMBER OF APPLICANT ASSOCIATION
☐ OFFICIAL OF GOVERNMENTAL ENTITY COMPETENT UNDER THE JURISDICTION TO SIGN FOR THE APPLICANT

Remarks:

FCC FORM 714
JULY 1967

FEDERAL COMMUNICATIONS COMMISSION
Washington, D. C. 20554

Form Approved
Budget Bureau No. 52-R178.1

SUPPLEMENT TO APPLICATION FOR NEW OR MODIFIED RADIO STATION AUTHORIZATION
(concerning antenna structure notification to FAA)

PART I - Instructions

1. When required, attach this form (ONE COPY ONLY) to application for radio station authorization (other than broadcasting) and submit to Federal Communications Commission, Washington, D. C. 20554. If more than one FAA Notice (see Part III below) was sent to FAA for antenna structure(s) covered by the attached application, submit a copy of this form for each such notification.
2. If the attached application is for modification and original application file number is known, enter file number in item 3 below.
3. Do not correspond with the Federal Communications Commission concerning Part 77 of the Federal Aviation Administration (FAA) Regulations. Information concerning FAA Rules should be obtained from one of the FAA Regional Offices listed on the reverse of this form.
4. Form FAA No. 117 "Notice of Proposed Construction or Alteration" is to be used for antenna structure notification to the Federal Aviation Administration. That form may be obtained from any one of the offices listed on the reverse of this form and should be returned to the Federal Aviation Administration.

PART II - Identification of Applicant

1. Name of Applicant (must be same as shown on attached application for radio authorization)

2. Name of Radio Service

3. Application File Number (see Instruction 2 above)

PART III - Status of Notice to FAA

The Federal Aviation Administration requires notification of proposed antenna structure construction or alteration in accordance with its Part 77 Regulations, "Notice of Construction or Alteration affecting Navigable Airspace". Check 1 or 2 below and furnish the information requested.

1. ☐ NOTIFICATION HAS BEEN SUBMITTED TO FAA

a. Name used (individual, company, corporation etc.) in making notification of construction or alteration to FAA

b. FAA regional office where filed

c. Date of notification to FAA

d. Location of Antenna Structure as reported to FAA
City _____ State _____
Geographical Coordinates
Latitude _____ N
Longitude _____ W

e. Height of completed Antenna Structure as reported to FAA
Overall Height above ground level _____ ft.
Overall height above mean sea level _____ ft.

2. ☐ NOTIFICATION HAS NOT BEEN SUBMITTED TO FAA - The proposed antenna structure(s) covered in attached application being submitted to FCC has been analyzed under Part 77 of the FAA Regulations and it has been determined that notification to FAA is not required.

PART IV - Certification

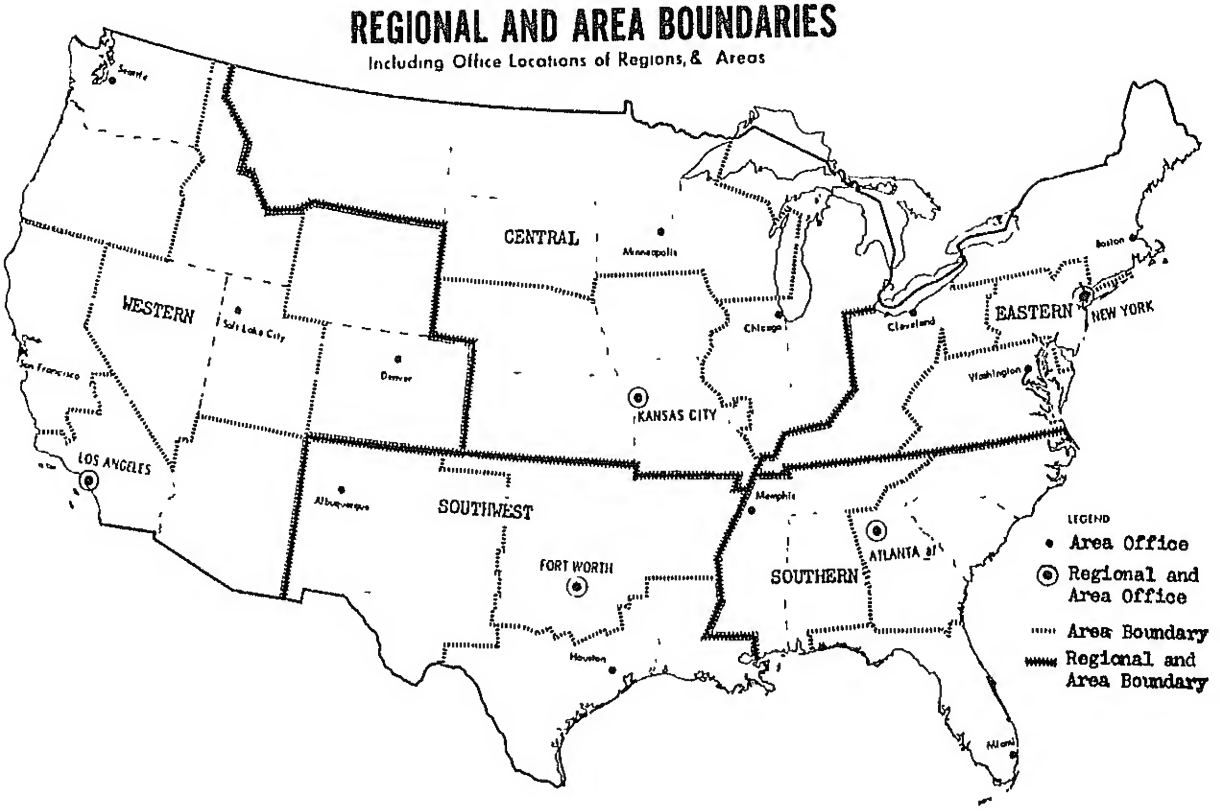
I certify that all of the above statements are true, complete, and correct to the best of my knowledge.

Date Signed _____ Signature of person certifying _____

Federal Aviation Administration

REGIONAL AND AREA BOUNDARIES

Including Office Locations of Regions, & Areas



FAA AREA OFFICE	MAILING ADDRESS
Chicago	3166 Des Plaines Ave., Des Plaines, Ill. 60018
Kansas City	4747 Troost Ave., Kansas City, Mo. 64110
Minneapolis	6301 34th Ave., South, Minneapolis, Minn. 55450
Boston	N. W. Industrial Park, Burlington, Mass. 01804
Cleveland	21010 Center Ridge Rd., Cleveland, Ohio 44116
New York	JFK International Airport, Jamaica, N. Y. 11430
Washington	900 South Washington St., Falls Church, Va. 22046
Atlanta	P.O. Box 20636, Atlanta, Ga. 30320
Memphis	3400 Democrat Rd., Memphis, Tenn. 38118
Miami	International Airport, Miami, Fla. 33159
Albuquerque	5301 East Central Ave., Albuquerque, N. M. 87108
Forth Worth	819 Taylor Street, Fort Worth, Tex. 76102
Houston	8345 Telephone Rd., Houston, Tex. 77060
Denver	8055 East 32nd Ave., Denver, Colo. 80207
Los Angeles	5885 W. Imperial Highway, Los Angeles, Calif. 90045
Salt Lake City	116 North 23rd West, Salt Lake City, Utah 84116
San Francisco	831 Mitten Rd., Burlingame, Calif. 94010
Seattle	Boeing Field, Seattle, Wash. 98108

NOTICE OF PROPOSED CONSTRUCTION OR ALTERATION

OBJECTS AFFECTING NAVIGABLE AIRSPACE NOTICE OF CONSTRUCTION OR ALTERATION

§77.13 Construction or alteration requiring notice

(a) Except as provided in §77.15, each sponsor who proposes any of the following construction or alteration shall notify the Administrator in the form and manner prescribed in §77 17

(1) Any construction or alteration of more than 200 feet in height above the ground level at its site.

(2) Any construction or alteration of greater height than an imaginary surface extending outward and upward at one of the following slopes

(i) 100 to 1 for a horizontal distance of 20,000 feet from the nearest point of the nearest runway of each airport specified in subparagraph (5) of this paragraph with at least one runway more than 3,200 feet in actual length, excluding heliports

(ii) 50 to 1 for a horizontal distance of 10,000 feet from the nearest point of the nearest runway of each airport specified in subparagraph (5) of this paragraph with its longest runway no more than 3,200 feet in actual length, excluding heliports

(iii) 25 to 1 for a horizontal distance of 5,000 feet from the nearest point of the nearest landing and takeoff area of each heliport specified in subparagraph (5) of this paragraph

(3) Any highway, railroad, or other traverse way for mobile objects, of a height which, if adjusted upward 17 feet for an Interstate Highway that is part of the National System of Military and Interstate Highways where overcrossings are designed for a minimum of 17 feet vertical distance, 15 feet for other highways, 25 feet for a railroad, and for any other traverse way, an amount equal to the height of the highest unshielded mobile objects that would normally traverse it, would exceed a standard of subparagraph (1) or (2) of this paragraph

(4) When requested by the FAA, any construction or alteration that would be in an instrument approach area (defined in the FAA standards governing instrument approach procedures) and available information indicates it might exceed a standard of Subpart C of this part

(5) Any construction or alteration on any of the following airports (including heliports)

(i) An airport that is available for public use and is listed in the Airport Directory of the current Airman's Information Manual or in either the Alaska or Pacific Airman's Guide and Chart Supplement.

(ii) An airport under construction, that is the subject of a notice or proposal on file with the Federal Aviation Administration, and except for military airports, it is clearly indicated that that airport will be available for public use.

(iii) An airport that is operated by an armed force of the United States.

(b) Each sponsor who proposes construction or alteration that is the subject of a notice under paragraph (a) of this section and is advised by an FAA area office that a supplemental notice is required shall submit that notice on a prescribed form to be received by the FAA area office at least 10 hours before the start of the construction or alteration

(c) Each sponsor who undertakes construction or alteration that is the subject of a notice under paragraph (a) of this section shall, within 5 days after that construction or alteration reaches its greatest height, submit a supplemental notice on a prescribed form to the FAA area office having jurisdiction over the area involved, if–

(1) The construction or alteration is more than 200 feet above the surface level of its site, or

(2) An FAA area office advises him that submission of the form is required.

§77.15 Construction or alteration not requiring notice.

No person is required to notify the Administrator for any of the following construction or alteration

(a) Any object that would be shielded by existing structures of a permanent and substantial character or by natural terrain or topographic features of equal or greater height, and would be located in the congested area of a city, town, or settlement where it is evident beyond all reasonable doubt that the structure so shielded will not adversely affect safety in air navigation

(b) Any antenna structure of 20 feet or less in height except one that would increase the height of another antenna structure.

(c) Any air navigation facility, airport visual approach or landing aid, aircraft arresting device, or meteorological device, of a type approved by the Administrator, the location and height of which is fixed by its functional purpose

(d) Any construction or alteration for which notice is required by any other FAA regulation

§77 17 Form and time of notice.

(a) Each person who is required to notify the Administrator under §77 13 (a) shall send one executed form set (four copies) of FAA Form 7460-1, "Notice of Proposed Construction or Alteration," to the Chief, Air Traffic Branch, FAA Area Office (or, Chief, Air Traffic Division, for the Alaskan and Pacific Region) having jurisdiction over the area within which the construction or alteration will be located. Copies of FAA Form 7460-1 may be obtained from the headquarters of the Federal Aviation Administration, the regional and the area offices

(b) The notice required under §77 13 (a) (1) through (4) must be submitted at least 30 days before the earlier of the following dates–

(1) The date the proposed construction or alteration is to begin.

(2) The date an application for a construction permit is to be filed. However, a notice relating to proposed construction or alteration that is subject to the licensing requirements of the Federal Communications Act may be sent to the FAA at the same time the application for construction is filed with the Federal Communications Commission, or at any time before that filing

(c) A proposed structure or an alteration to an existing structure that exceeds 2,000 feet in height above the ground will be presumed to be a hazard to air navigation and to result in an inefficient utilization of airspace and the applicant has the burden of overcoming that presumption. Each notice submitted under the pertinent provisions of Part 77 proposing a structure in excess of 2,000 feet above ground, or an alteration that will makean existing structure exceed that height, must contain a detailed showing, directed to meeting this burden Only in exceptional cases, where the FAA concludes that a clear and compelling showing has been made that it would not result in an inefficient utilization of the airspace and would not result in a hazard to air navigation, will a determination of no hazard be issued

(d) In the case of an emergency involving essential public services, public health, or public safety, that requires immediate construction or alteration, the 30-day requirement in paragraph (b) of this section does not apply and the notice may be sent by telephone, telegraph, or other expeditious means, with an executed FAA Form 7460-1 submitted within five days thereafter Outside normal business hours, emergency notices by telephone or telegraph may be submitted to the nearest FAA Flight Service Station.

(e) Each person who is required to notify the Administrator by paragraph (b) or (c) of §77 13, or both, shall send an executed copy of FAA Form 117–1, "Notice of Progress of Construction or Alteration" to the Chief, Air Traffic Branch, FAA Area Office (or, Chief, Air Traffic Division, for the Alaskan or Pacific Region) having jurisdiction over the area involved

ADDRESSES OF THE REGIONAL AND AREA OFFICES

AL–ALASKAN REGION

Alaskan Regional Office
632 Sixth Avenue
Anchorage, Alaska 99501
907 272-5561

CE–CENTRAL REGION

Central Regional Office
601 E 12th Street
Kansas City, Mo., 64106
816-374 3246

Chicago Area Office
3166 Des Plaines Avenue
Des Plaines, Ill., 60018
312-296-1161

Kansas City Area Office
4747 Troost Avenue
Kansas City, Mo., 64110
816-374 3706

Minneapolis Area Office
6301 34th Avenue South
Wold Chamberlain Airport
Minneapolis, Minn., 55450
612-334-3352

EA–EASTERN REGION

Eastern Regional Office
JFK International Airport
Federal Building
Jamaica, New York 11430
212 995-3333

Boston Area Office
Building 3
Northwest Industrial Park
Burlington, Mass., 01804
617-272-2350

Cleveland Area Office
21010 Center Ridge Road
Westview Building
Rocky River, Ohio 44116
216-333-6439

New York Area Office
181 South Franklin Avenue
Valley Stream, New York 11581
212-995 3333

EA–(CONT'D)

Washington Area Office
900 South Washington St.
Falls Church, Va., 22046
703 557 1390

PC–PACIFIC REGION

Pacific Regional Office
P.O. Box 4009
Honolulu, Hawaii 96812
566111

SO–SOUTHERN REGION

Southern Regional Office
P.O. Box 20636
Atlanta, Georgia 30320
404-526-7541

Atlanta Area Office
P O. Box 20636
Atlanta, Georgia 30320
404-526-7238

SO–(CONT'D)

Memphis Area Office
P.O Box 18097
Memphis, Tennessee 38118
901-534-4201

Miami Area Office
P.O Box 2014, AMF Branch
Miami, Florida 33159
305-634 5481

San Juan Area Office
RFD 1, Box 29A
Loiza Street Station
San Juan, Puerto Rico
791-2310

SW–SOUTHWEST REGION

Southwest Regional Office
P.O. box 1689
Fort Worth, Texas 76101
817-624-4911

SW–(CONT'D)

Albuquerque Area Office
5301 Central Avenue
P.O Box 8502
Albuquerque, N.M. 87108
505-265-8091

Houston Area Office
P O. Box 60470
Houston, Texas 77060
713-643-0661

Fort Worth Area Office
819 Taylor Sueet
Fort Worth, Texas 76102
817-334-3501

WE–WESTERN REGION

Western Regional Office
5651 West Manchester Avenue
P O Box 90007
Los Angeles, Calif., 90009
213-670-7030

WE–(CONT'D)

Denver Area Office
10255 E 25th Avenue
Aurora, Colorado 80010
303-297-3646

Los Angeles Area Office
5885 Imperial Highway
Los Angeles, Calif. 90045
213-670-7704

Salt Lake City Area Office
2398 West North Temple
Salt Lake City, Utah 84116
801-524-4201

San Francisco Area Office
831 Mitten Road
Burlingame, Calif., 94010
415-692-2441

Seattle Area Office
FAA Building
Boeing Field
Seattle, Washington, 98108
206-762-4100

THIS IS YOUR WORKSHEET

Form Approved. Budget Bureau No. 04-R0001.

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

NOTICE OF PROPOSED CONSTRUCTION OR ALTERATION

NOTICE TO PREPARER OF FORM

1. Retain this Work Sheet as your copy.
2. Complete and return the remaining four copies.
3. Be sure all copies are legible.
4. If a Notice is not required or if a Standard of Subpart C, Part 77, is not exceeded, a copy of this form will be returned to you appropriately marked in this area, otherwise a separate acknowledgement will be made within 30 days from receipt of Notice.
5. Print or type all items. The address area will be used to return a copy of this form. (see above)
6. Notification to the FAA does not waive the requirements of any other Government Agency.

1. NATURE OF STRUCTURE *(Complete both A and B below)*

A. *(Check one)* ☐ NEW CONSTRUCTION ☐ ALTERATION

B. *(Check one)* ☐ PERMANENT ☐ TEMPORARY *(State length of time)* _____ Mos.

2. NAME AND ADDRESS OF INDIVIDUAL, COMPANY, CORPORATION, ETC. PROPOSING THE CONSTRUCTION OR ALTERATION *(Number, Street, City, State and Zip Code)*

TO

3. TYPE AND COMPLETE DESCRIPTION OF STRUCTURE:

4. LOCATION OF STRUCTURE

A. COORDINATES *(To nearest second)*						B. NEAREST CITY OR TOWN, AND STATE	
LATITUDE			LONGITUDE				
°	'	"	°	'	"	(1) DISTANCE FROM 4B MILES	(2) DIRECTION FROM 4B

C NAME OF NEAREST AIRPORT, HELIPORT, OR SEAPLANE BASE	(1) DISTANCE FROM NEAREST POINT OF 4C	(2) DIRECTION FROM AIRPORT

D. *DESCRIPTION OF LOCATION OF SITE WITH RESPECT TO HIGHWAYS, STREETS, AIRPORTS, PROMINENT TERRAIN FEATURES, EXISTING STRUCTURES, ETC. (Attach a highway, street, or any other appropriate map or scaled drawing showing the relationship of construction site to nearest airport(s). If more space is required, continue on a separate sheet of paper and attach to this notice.)*

5. HEIGHT AND ELEVATION *(Complete A, B and C to the nearest foot)*

A. ELEVATION OF SITE ABOVE MEAN SEA LEVEL	
B. HEIGHT OF STRUCTURE INCLUDING APPURTENANCES AND LIGHTING *(if any)* ABOVE GROUND, OR WATER IF SO SITUATED	
C. OVERALL HEIGHT ABOVE MEAN SEA LEVEL *(A + B)*	

6. WORK SCHEDULE DATES

A. WILL START

B. WILL COMPLETE

7. OBSTRUCTION MARKINGS – The completed structure will be:

	YES	NO
A. MARKED AS SPECIFIED IN THE FAA ADVISORY CIRCULAR 70/7460-1, OBSTRUCTION MARKING AND LIGHTING		
B. LIGHTED AS SPECIFIED IN THE FAA ADVISORY CIRCULAR 70/7460-1, OBSTRUCTION MARKING AND LIGHTING		

I HEREBY CERTIFY that all of the above statements made by me are true, complete, and correct to the best of my knowledge.

8. NAME AND TITLE OF PERSON FILING THIS NOTICE *(Type or Print)*	9. SIGNATURE *(In ink)*
	10. DATE OF SIGNATURE / 11. TELEPHONE NO. *(Precede with area code)*

Persons who knowingly and willfully fail to comply with the provisions of the Federal Aviation Regulations Part 77 are liable to a fine of $500 for the first offense, with increased Penalties thereafter as provided by Section 902(a) of the Federal Aviation Act of 1958 as amended.

FAA Form 7460-1 (11-68) SUPERSEDES FAA Form 117.